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Symposium on Bite Planes

BITE PLANES

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THE term bite planes is used following Kelsey,[1] as this phrase includes appliances of all types having an inclined plane, whether this plane is placed upon a removable plate or upon a fixed lingual appliance. The bite *plate,* as I now use it, is a modification developed by Atkinson, of the Hawley removable retainer. It has generally been restricted to use during secondary treatment or for retention. This discussion is more particularly based on the specialized form of inclined bite plane evolved through the years since 1919 by Oren Oliver,[2] and called by him the guide plane. This appliance is built upon the upper lingual arch and is used during active treatment. In general, all forms of bite planes, whether they be Hawley, Atkinson, Jackson,[3] Oliver, or any other type, may be grouped together and considered the same, insofar as tissue changes are concerned.

The allotted time permits but brief reference to the literature on the subject of bite planes.. The older writings are entirely concerned with the mechanics of "jumping the bite." C. C. Howard[4] and J. Lowe Young were among the first to consider vertical development. Robert Dunn[5] in 1926 emphasized the necessity for dealing with the problem of arrested vertical development in the molar and premolar region. Since the bite plane is usually used in an attempt to correct this condition (in addition to shifting arch relationship horizontally and depressing the mandibular anterior teeth), these men probably had an influence upon its development. Oren Oliver[2] introduced the guide plane in 1932. This was a distinct mechanical improvement and sometimes produced remarkable results. There are many scattered bite plane references throughout the

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literature included in articles on distoclusion and case reports. These invariably left to the imagination just what particular tissue changes were brought about by its use.

Rogers'[6] studies of the temporomandibular articulation, at first by digital examination and later by x-ray examination, showed the changes in the position of the condyle as the mandible shifted forward under treatment. Reisner[7] also, in extended x-ray examination of this area, has thrown much light on the problem. Kelsey[1] has recently presented a review of the history and use of the bite plane. Mershon[8] has pointed out certain possibilities and limitations that have a direct bearing on its use. It remained for Hemley[9] to be the first to devote himself to an exclusive scientific analysis of tissue changes resulting from the application of the bite plane.

The confusion now existing regarding the use of the bite plane is realistically illustrated by the replies received by me in recent correspondence with several orthodontists. These men represent a cross section geographically and in regard to their thoughts on appliance therapy. Relatively few use the bite plane very much during active treatment and most of these are men who use the Oliver guide plane. Some use a bite plate for opening the bite preliminary to treatment. Some use a flat bite plane with no incline in conjunction with intermaxillary elastics. Grieves[10] uses buccal planes on the molars for stimulating growth in length of the mandible. A great many use the bite plate after active treatment in the retention of corrected distoclusion cases. Some use this plate all of the time, others at night only. Many utilize supplemental myofunctional therapy, either before, during, or after active treatment, or throughout all three of these phases. James David McCoy[11] says: "In brief then, I utilize the bite plate both as a retainer and as a secondary treatment appliance, with the bite plane added in those cases when it is necessary. I have my patients wear it at night only, and utilize it in nearly all cases where the lower teeth have previously occupied a posterior malrelationship. In conjunction with it, I have the patients take muscle exercises, with their efforts directed toward the temporal and masseter groups." Many replies seem to indicate certain misgivings with reference to what may be accomplished and just what cases to select for its use. An example of this feeling is Woodbury's[12]: "The response in my hands is so various both as between different patients and at different periods in the same patient that I always wonder how much of the result is due to my appliance and how much to growth changes. However, I do feel that the principle of the bite plane is useful even if it is difficult to say in the individual how effective it has been." Some orthodontists do not use bite planes in any form.

The varying opinions indicated are no different in kind or degree from those expressed concerning other appliances in general use. Treatment with the bite plane is still more or less empirical,[13] the same as with other appliances. A brief résumé of present knowledge and conjecture should assist us in evaluating the usefulness of this appliance. For simplicity we might consider reactions only in the treatment of Angle Class II cases, since these are by far the most important group in this connection (Fig. 1).

1. It causes the condyles of the mandible to move forward on the eminentia articularis. As adaptation of tissues takes place, the condyles slide back to

their ordinary relation. Rogers points out that such changes are within "normal limits." Reisner[7] states: "It is a fallacy to expect a new glenoid fossa to form to accommodate a condyle head that has been forced forward either through traction or a bite plane and maintained there. . . . The only reaction I find is a destructive action of the posterior surface of the articular eminence or the anterior margin of the condylar head, or a combination of both." How important this destructive action may be is a point requiring amplification. Reisner also adds: "There is another condition that does arise when the condyle head is subjected to sufficient traction force, and that is a readjustment of the angle of the head and neck in the direction of the force." Atkinson[14] also feels that there is a definite deformation of the head of the condyle and eminentia.

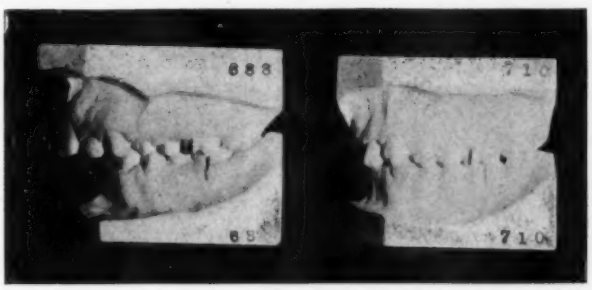

Fig. 1.—Class II (Angle) Division 1 (left), Division 2 (right).

2. It opens the bite so that the overjet of anterior teeth is diminished. Usually the appliance holds the posterior teeth apart. Just what happens in all cases is a controversial point, although Hemley's work points to vertical growth of the posterior teeth and surrounding alveolar process as the important result. Clinical experience seems to corroborate this point although it has not yet been proved that these teeth are not again depressed when the bite plane is removed. Hemley and Strang[15] both feel that this natural vertical growth may be maintained through the establishment of a more normal bone metabolism after adolescence. Mershon and others believe that the main result would be the depression of the mandibular anterior teeth. Since the bite plane causes pressure on these teeth, this would seem plausible, although Hemley's[9] measurements indicate little change in this region. Wolfson,[16] taking careful measurements in adult cases, shows depression of mandibular anterior teeth as the important result. Reisner[7] states that "raising the bite" in cases of supraclusion of the anterior teeth by means of prosthetic appliances on the posteriors will result in failure. In these cases the anterior teeth must be depressed or the bite will not be opened. Possibly in some cases the vertical growth of posterior teeth is more important; in others the depression of the lower anteriors is more important; or both may occur in the same case. It seems that teeth will move best and easiest into that position which nature intended them to occupy. Since there are no two cases alike, it would seem that depression of anterior teeth, elevation of posterior teeth or a combination of these two reactions might well be all desirable changes in different individuals. I have never seen either of these changes to be excessive enough to produce unfavorable conditions in properly selected cases.

3. It produces changes in the muscles of mastication and secondarily in some of the muscles of expression. These changes are rather complicated, inasmuch as they are the result of the forward movement in the relation of the mandible and of opening the bite. The possibility of "stretching" of the muscles is objected to by Mershon[8] and others who cite numerous authorities that muscles once fully formed cannot be elongated. It may be pointed out that the muscles in a distoclusion case under correction by a bite plane are now in as near their normal relation as can be determined, rather than in their distorted position with the mandible retruded. It is difficult to state whether they are really stretched or not, even temporarily. If they are stretched, it may be possible that a certain amount of reattachment of muscle fibers gradually takes place. In patients of orthodontic age the muscles surely are capable of growth and development and adaptation to changed function, especially if the change is toward the normal. Rogers[6] points out that external pterygoid exercise is one of the first features in his treatment of distoclusion cases; these being followed by masseter-temporal exercises.

4. The occlusion is changed from a posterior relation of the mandibular teeth to a more normal anteroposterior relationship. This occurs as the premolars and molars settle down into occlusion. In the case of the guide plane, this change is accurately controlled and occlusion is brought as close to normal as possible.

5. As the head of the condyle of the mandible slips back into its ordinary position, changes must occur in other portions of this bone. McCoy has shown conclusively that[17] there is increase in the body of the mandible, an increase in the rami of the mandible, and changes in the angle of the mandible. "Mandibular patterns are changed with growth occurring in any of its parts, depending upon whether there is need for it." These measurements apply to children of eight to thirteen years of age with dwarfed mandibles treated by means of elastic traction followed by bite plates. In these cases he emphasizes the change in the pattern of the mandible. In distoclusion cases with more normal mandibles, the pattern of the mandible does not change even though there is an increased increment after treatment. Some think that there may be a forward shifting of mandibular teeth through the alveolar process. There may be some posterior shifting of the maxillary teeth. Whatever changes occur they are similar to what would take place more gradually under the use of intermaxillary elastics alone.

6. Profile changes occur as a result of the above changes in the occlusion, in the muscles, and in the mandibular size and pattern. Hellman[18] has suggested that normal profiles may not necessarily follow the establishment of normal occlusion. Clinical evidence indicates that facial outlines are usually improved. The extent to which normal faces may be expected to follow bite plane therapy depends upon the inherent and developmental limitations and possibilities in a given case.

The gross or observable changes toward normal mentioned in the preceding paragraph may be brought about more effectively by the use of the Oliver guide plane than by means of the usual bite plane. Since the construction and use of this appliance will be thoroughly discussed in Oliver's new book to be pub-

lished shortly, only brief mention of these points will be included in this paper. In the guide plane the construction of the mandibular and maxillary lingual arches is accomplished according to a definite technique, differing materially from that of the usual bite plane. The lower lingual wire extends forward in an arch to a point just posterior to the position in which the cross bar of the upper inclined plane will touch when the teeth are placed in a normal antero-posterior relation (Fig. 2). This is determined by careful marking, with the casts occluded in the position desired (Figs. 3 and 4). The guide wire of the inclined plane is usually constructed so that it lies along the lingual incline of the mandibular canines. This may be modified to fit conditions. It is very

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

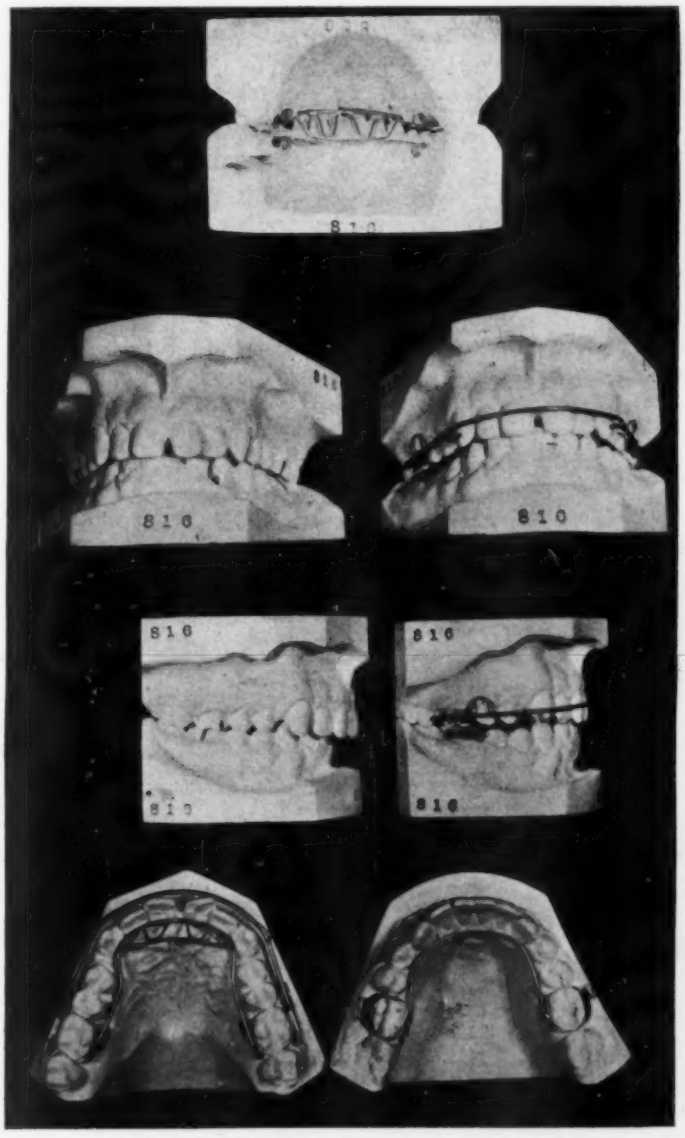

Fig. 2.—Showing relation of lower lingual arch wire in guide plane assembly.

Fig. 3.—Left, original occlusion. Right, casts immediately after placing guide plane; occluded as desired.

Fig. 4.—Left, original casts. Right, casts immediately after placing guide plane; occluded as desired.

Fig. 5.—Complete guide plane assembly. A lower labial arch is usually used instead of the lower molar hooks.

carefully constructed with frequent trials. Viewing the work from the back opening of the occluded casts is important. The inclined plane is made of wire by filagree interlacing. Upper and lower labial wires are used. The upper labial wire carries hooks for elastics. The lower labial prevents forward tipping of anterior teeth. The upper labial wire may be connected with the upper lingual wire by anterior through and through ligatures. Both labial wires help to stabilize the molars against possible tipping. The technique of construction can, I believe, be best learned by observing the construction of several cases (Fig. 5).

The guide plane may be placed immediately as the first step in treatment (Fig. 3). In other cases, it is placed after removing interference (Fig. 6). In many cases rotation, retrusion, expansion, etc., are carried on simultaneously with guide plane treatment. Sometimes the posterior occlusion of the mandibular arch and the protrusion of the maxillary anterior teeth may be so severe that it cannot be placed in its ultimate position immediately because the patient would be able to engage his lower incisors posteriorly to the guide plane. In these cases it is constructed so that the bite is not advanced all of the way at one time but is gradually shifted forward (Figs. 7, 8, and 9). Often there is a single incisor in the mandibular arch placed back of the others so that it would alone bear the brunt of contact with the guide plane. Usually this tooth should be moved forward before placing a guide plane. Myofunctional exercises are often used prior to mechanical treatment. They are always used during active treatment and retention.

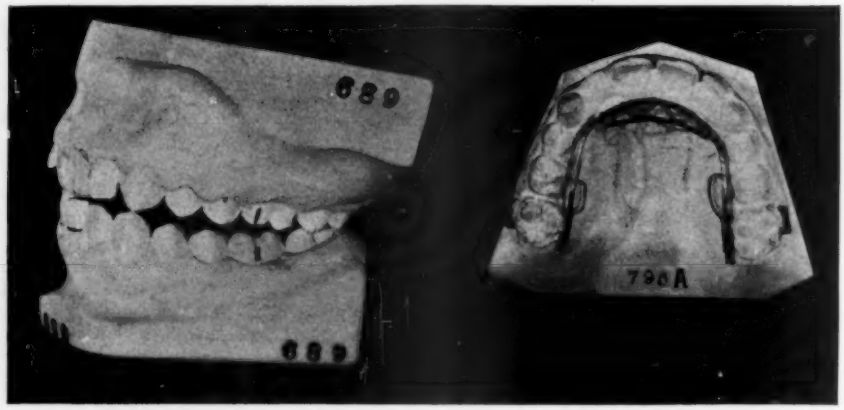

Fig. 6. Fig. 7.

Fig. 6.—This illustrates delayed guide plane treatment. Casts cannot be placed in normal occlusion. The relation of arches cannot be changed until maxillary incisor interference is removed.

Fig. 7.—Showing method of advancing the guide plane by opening the loops.

A list of advantages follows:

1. It changes the bite to normal immediately in most cases, thus cutting down considerably the length of treatment (Fig. 3).

2. In placing the arches in normal relation, they are placed so that normal muscular action is possible from the beginning of treatment. This is most important as in most cases abnormal muscular action is present (Fig. 10).

3. It opens the bite for the possible vertical growth in the molar and premolar region so often required and so slowly obtained by other methods (Fig. 4).

4. It opens the bite for a more favorable movement of maxillary individual teeth which may be locked in position of malocclusion prior to the placement of the plane (Fig. 11).

5. It fixes the bite at the perfect normal relation as far as we may determine, rather than a hit or miss relation obtainable when using elastics alone (Fig. 4).

6. It changes the profile immediately, creates confidence, initiates greater cooperation as patient can readily see what is to be the end result. Parents are most favorably impressed (Fig. 12).

7. The immediate placement of the guide plane provides for normal breathing instead of mouth breathing, due to the establishment in normal position of the jaws and lips (Fig. 10).

Fig. 8.

Fig. 9.

Fig. 8.—A study in improved psychology.

Fig. 9.—Left, profile at start of myofunctional therapy. Right, profile after myofunctional therapy and modified guide plane treatment.

8. It tends to break up tongue habits, lip biting, thumb-sucking and other deleterious habits (Fig. 10).

9. Failure, due to lack of cooperation in wearing elastics, is overcome. A patient may wear the elastics or leave them off and the bite remains the same.

10. Other treatment can be carried out simultaneously, as the bite is being changed. It is common practice to expand the upper arch and move maxillary anteriors back, or rotate them, while the guide plane is in position.

11. In the troublesome dual-bite condition there is a distinct advantage over elastics, as the patient cannot change from one bite to another.

Some disadvantages are:

1. As indicated in discussion of tissue reactions under the use of bite planes in general, we feel this may be unfavorable in certain cases, in the region of the condyle, its neck, and the eminentia articularis.

2. It seems to be rather a radical and sudden change, especially in older cases which have been in posterior relation over a long period of years.

3. It may be difficult for the patient to become used to chewing in an entirely new manner. It may place considerable initial strain on the muscles involved.

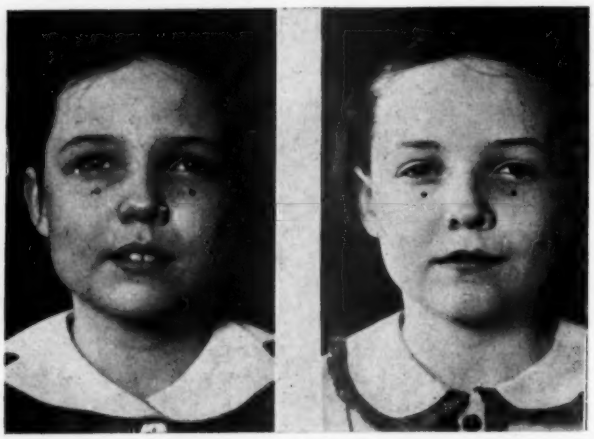

Fig. 10.—Immediate change in muscular action. Left, before placing guide plane. Right, six weeks later.

Fig. 11.—Left, original casts showing maxillary bicuspids misplaced in complete buccal relation to the mandibulars. The guide plane opens the bite so that there is no interference offered to moving these teeth lingually. Right, after treatment.

4. It sometimes cannot be used if teeth are in such a position that there is a great deal of interference when the lower arch is placed in the forward relation. This condition is common in Class II, Division 2 cases (Angle) and can be remedied by first removing the interference.

5. Cases must be carefully selected, being sure that the lower arch is actually in posterior relation to the normal. Also it should never be used where there is any tendency toward an open-bite condition.

6. Too much strain may be placed upon anchorage when this is obtained solely by banding the sixth year molars. This may result in tipping of maxillary

or mandibular molars. It may be controlled by utilizing additional anchorage. Ligatures connecting the upper lingual and labial arch in the incisor region are helpful. The use of a lower labial arch for additional stabilization is usually recommended.

7. Irritation of the maxillary anterior palatal mucosa may sometimes be produced.

8. Technical aspects of construction must be most exacting. Considerable time and effort are often necessary for such construction. There should be no hit or miss compromise. However, this should be true of all appliances.

Fig. 12.—Showing immediate changes in profile following placing of guide plane.

Fig. 13.—Forward drift of maxillary teeth. Not a guide plane case.

Careful diagnosis is most important in deciding whether to use an inclined plane in any of its forms. The case must be a true posterior relation of the lower arch and not one in which the teeth of the upper arch are in a forward position. Many so-called Class II conditions are not true mandibular or dental retroversions, but represent a forward positioning of the maxillary teeth (Fig. 13).[19] (Mershon, Grieves, and Atkinson have demonstrated effective means to correct this condition.) I believe that there are many examples of both of these kinds of malocclusion. The relation of maxillary teeth to the skull may be

determined by various methods, including gnathostatics, photostatics, the use of the key ridge of Atkinson,[20] by observation of the axial inclination of the teeth of the maxillary lateral segments, by profile observation, or by other means. Jackson's method of requiring the patient to close in normal relation and observing the various tissues in this relation is simple and most practical. The age of the patient presents a problem. During certain growth stages, a close-bite may be present, only to open up as natural development proceeds. The curve of Spee or its lack should be noted. Cases which present two levels

Fig. 14.

Fig. 15.

Fig. 16.

Fig. 14.—Mandibular retroversion. Left, Class II, Division 1 (Angle). Right, Class II, Division 2 (Angle).

Fig. 15.—Left, dwarfed mandible. Right, some improvement after treatment. Result limited by hereditary characteristics.

Fig. 16.—Mandible is of fair size but in posteroclusion.

in the occlusal plane of the mandibular teeth rather than a continuous rise are, according to Hemley, adapted to bite plane therapy.

In my practice, the use of the guide plane is ordinarily limited to cases of mandibular retroversion.[21] These are true Class II, Division 1, or Class II, Division 2, cases (Angle), or their subdivisions (Fig. 14). The profile in these cases exhibits a deficient chin. In the severe cases it is associated with a dwarfed mandible[16] (Fig. 15). These are called micromandibular by Lischer. In other cases the mandible may be of fair size but in a position posterior to the normal

Fig. 17.

Fig. 18.

Fig. 19.

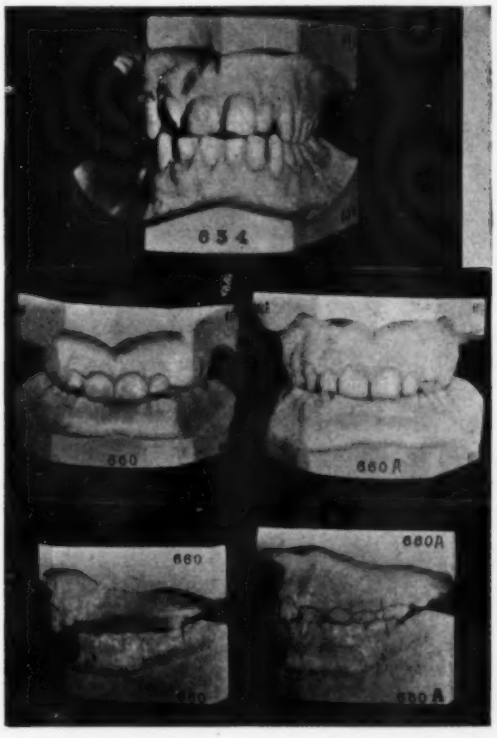

Fig. 17.—Tendency toward open-bite. Not suitable for guide plane therapy.
Fig. 18.—Transition phase guide plane treatment.
Fig. 19.—Same case as Fig. 18. The guide plane seems to direct the normal positioning of erupting premolars and canines.

Fig. 20.—Same case as Figs. 18 and 19. Severe cases may be started during transition phases.

(Fig. 16). These cases all require change in position of the mandible followed by greater or less change in the angle, the rami, or the body of this bone (Fig. 15—right). They must exhibit an exaggerated overjet of the anterior teeth (it is again emphasized that the guide plane opens the bite and for this reason must never be used when there is the least tendency toward open-bite) (Fig. 17). The overjet of the anterior teeth may be due to a failure in vertical development of the posterior teeth or an overdevelopment in vertical height of the mandibular anterior teeth, or both. In some cases there is also present a supraclusion of the maxillary anterior teeth. This is treated separately. The proper age for placing the guide plane depends upon practical and developmental factors. Since there does not seem to be any appreciable vertical growth of deciduous molars attending its use it would probably not be particularly indicated during the deciduous dentition phase. Cases have been successfully treated during transition dentition from eight and a half years on. In these cases it has seemed to guide and direct the erupting premolars and permanent canines (Figs. 18, 19, 20). However, diagnosis may be difficult in many mouths at this stage, and I usually limit application of this therapy to severe conditions in which growth guidance is definitely necessary. It seems most useful in properly selected cases when used just before, or during, or just after the second permanent molar has erupted (Figs. 21 and 22). Good results at fifteen, sixteen, and seventeen years, or even later, are common.

Fig. 21.

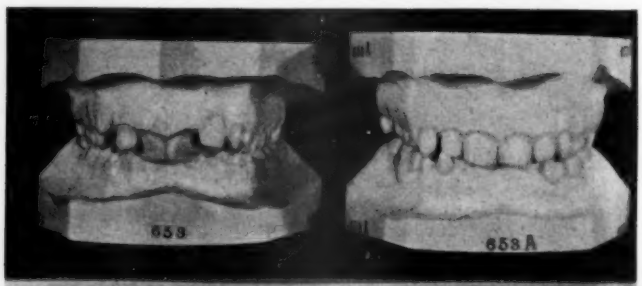

Fig. 22.

Fig. 21.—An ideal time to start treatment seems to be at adolescence. This case started at fourteen.

Fig. 22.—Same case as Fig. 21. Interference was removed. Myofunctional therapy was used. The guide plane was left on for a year. The Atkinson retainer was used as a further "prop."

Even with careful diagnosis there are those cases in which guide plane therapy seems definitely indicated, but which do not respond satisfactorily. No one should be surprised. Errors in diagnosis are not unknown even when one has utilized all available methods and data. Heredity offers a definite limit to treatment possibilities. Factors of environment, including nutrition, health

habits, and systemic disturbances may prevent the successful conclusion of any case. Lack of complete knowledge as to tissue reaction with the appliance has been indicated above. In certain cases some of this reaction may be unfavorable. Those who know the appliance simply feel that it is suited to take care of certain types of malocclusion. In such cases it seems to place the teeth, bones and muscles in an advantageous position for the encouragement of rapid normal growth and development.

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1726 EYE STREET

THE USE OF BITE PLATES

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BITE plates can be used as an aid in the prevention and correction of minor malocclusions. This paper is limited to the use of the bite plate as a working appliance and not as a retainer.

In many cases this appliance offers an aid to bring orthodontic therapy to many patients who, through financial or geographical reasons, cannot have the constant attention of the specialist. It is removable, inexpensive, and, in properly selected cases, physiologic in action. It is not a panacea or easy method of orthodontic procedure.

Many objections have been raised against the use of vulcanite in the mouths of children and in contact with teeth. With care in construction and vulcanization, and an awarenes of what troubles to look for, these objections can be partially overcome and minimized. Plates with a base of vulcanite have to be watched carefully for tissue reactions. Tinning before vulcanization and careful brushing during periods of use and after each meal will obviate this fault. The use, on the plates, of diluted commercial antiseptic and cleansing solutions containing chlorine helps maintain healthy tissues. In some mouths which are not kept as clean as a dentist would recommend an etching or decalcification might be noted on surfaces of teeth in contact with the vulcanite. Lack of cleanliness is the answer.

The fundamentals of the various plates described are practically the same as have been given many times in the description of the Hawley retainer and bite plates and consist in most cases of a wire framework of either precious metals or of the nonprecious, so-called stainless steels with a base of vulcanite or if preferred of cast or swaged metal. The plates with a base of vulcanite are easily and cheaply constructed. Metallic plates are slightly more expensive to construct but are more comfortable and easily repaired.

The success in the use of any removable appliance depends, of course, upon the fact that it is presupposed that the patient will wear it. If not, it were better that it not be constructed. After experience in private and clinical practice the reasons of failure to wear these appliances can be traced to:

1. Lack of proper means of retention.
2. Too great pressure or force applied in tooth movement.
3. Lack of proper approach to the child for cooperation.
4. Lack of parental supervision or discipline.

Three per cent would be a generous allowance to make for patients who will not cooperate in following instructions in wearing plates.

Plates for the maxilla are a little more difficult to hold in place. In cases having a prominent bulge over the canine region, retention can most simply

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be secured by carrying the canine loop up over the bulge just high enough so as not to impinge on or irritate the labial fold. If this is not enough, a gingival clasp to engage the first premolar can be added but should be avoided where possible. The use of vulcanite to cover the hard palate completely instead of the so-called horseshoe palatal portion aids in retention and adds considerable strength and lessens chances of breakage.

As this device is used generally during a period when we are trying to encourage lateral growth or widening, the use of clasps or other devices which have a bearing on the buccal surfaces of the teeth should be frowned upon.

In deciduous or mixed dentures, it is usually necessary in the maxilla to band two teeth (right and left) in order to place cleats to hold the plate in position. This is particularly true when the anterior teeth are to be carried lingually in the correction of overjet.

Bite plates as a class, but differing in construction, can be used for:

1. Correction of overbite.
2. To stimulate development of upper incisal region.
3. To stimulate development of other limited areas.
4. To prevent extrusion.
5. To intrude teeth.
6. For space retainers.
7. To remove interferences in movement of other teeth.

Overbite is one of the commonest evils which we meet. Overjet is usually associated with it. The bite plate offers a great help in their correction.

Its use brings into play the function of the anterior teeth (incising food) which is so little called for in our modern diet and table manners. By removing occlusal contact (about 1 mm. at a time) in the molar and premolar region, there is an urge for the teeth to regain contact. This is especially true if the plate is used during periods when the teeth are in functional use (chewing). Best results are obtained in opening the bite if it is used at the periods coincident with the eruption of the premolar teeth so as to allow them to continue to erupt until in occlusal contact or during the times coincident with the eruption of the second permanent molar. At times (during growth spurts or during periods immediately before and during eruption of the second permanent molars) bite plates without the anterior labial section are of great assistance in helping in correction of Class II, Division 2 (Angle classification) cases. This is not recommended for all cases of this type, but rather for those cases when the maxillary anterior teeth are not tipped too far lingually and when our diagnosis would make us believe that the maxillary premolars and molars are in good cranial relationship.

By removing the labial loop, the biting forces against the plane of the plate tend to drive the maxillary incisors labially, stimulate forward growth in the mandible and open the bite, all of which are necessary to a correction in this type of case.

Working in the opposite direction, the action of the labial loop section of the plate can be used to correct overjet by discing away the vulcanite on the lingual side of the incisor and producing a slight pressure from the labial.

Overbite is usually a complication met in distal occlusion cases. When the maxillary teeth are in good cranial relationship and a forward development of the mandible is to be encouraged, the slantlike or incline type of lift is used. Where there is no mesiodistal correction to be made between the two jaws, the flat type of lift can be used, but is not necessary.

The planes or lifts on the plates have the further advantage of fanning out the roots of the mandibular anterior teeth with their attendant growth by striking on the high points of the incisal edges.

The bite plate can be used in the case of patients who grind their teeth at night and by removing the molars and premolars from occlusion it prevents the attendant noise and disturbance. In other cases, as most people do not normally sleep with their teeth in contact, it is not necessary and, being a foreign object, not advisable to wear the bite plate at night. This statement, however, is not true when the plate is also being used for purposes of retention.

A modification of the upper bite plate is one of similar construction for the mandible for forward development of the superior incisal region. This plate can be used effectively for carrying forward the entire superior incisal teeth or individual teeth which are in linguoversion. The plane is made very steep and is carried just over the incisal edge of the mandibular teeth. Care must be observed in cases where this is placed in position that it does not result in the so-called open-bite. When this happens, the remedy is to make the incline a little more steep or remove the plate.

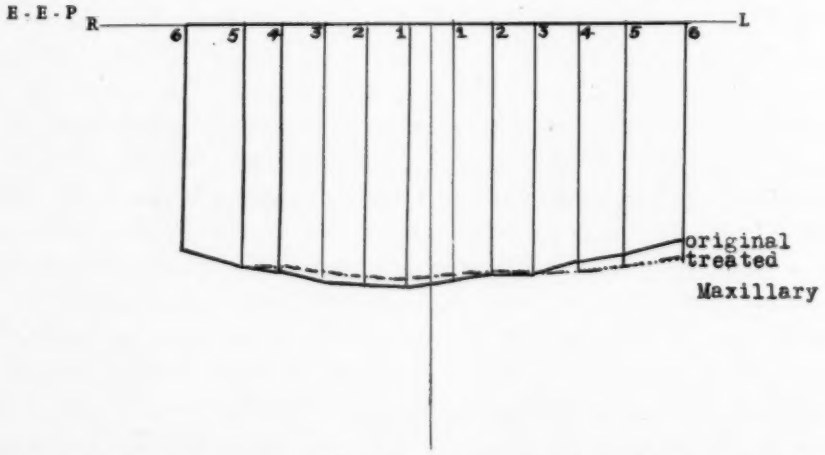

Fig. 1.—Gnathostatic chart indicating distance from eye-ear plane of measure points on maxillary teeth. Solid line is measurement on original cast. Broken line, after wearing bite plate, shows leveling out of the occlusal plane with slight intrusion in the incisal region and extrusion (or growth) in the molar region.

Bite plates to prevent extrusion, or in the same manner to intrude teeth, are so constructed that the forces of mastication or biting are concentrated on the tooth or teeth to be intruded. It might be argued that this is a dangerous practice, but it must be also considered that we are working with children whose repair processes are greater than their destructive or breakdown processes. It has often been noted that many cases of hypertrophy of the gingiva about the mandibular anterior teeth have been helped by the added function called for upon these teeth when the bite plate has been used.

As has been previously shown before this society by Dr. Ralph Eaton of Rochester, bite plates can be used in the correction of so-called open-bite cases by intruding or depressing the molar teeth where they have been diagnosed as being in supraclusion.

By removing a tooth from occlusal contact by temporarily raising the bite, its movement to a position of advantage can be facilitated and more easily accomplished.

The use of bite plates as space maintainers is included in this paper because it is usually advisable to prevent extrusion of an opposing tooth or teeth where premature extractions have been made. They have further advantages in that they:

1. Are easy to construct.
2. Do not require so much supervision.

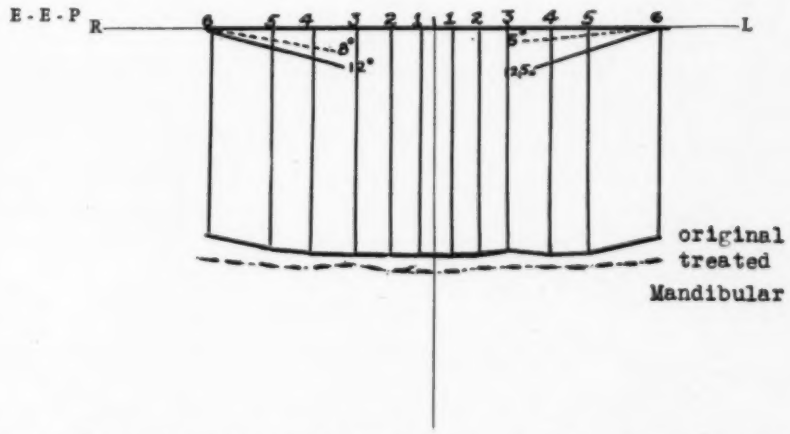

Fig. 2.—Gnathostatic chart indicating distance of measure points on the mandibular teeth from the eye-ear plane. Solid line is measurement on original cast; broken line, after wearing bite plate. Note the slight leveling out of the occlusal plane and the changes in the angle of the occlusal plane as shown at the base *E-E-P*. The apparent depression of all the teeth (or growth away from *E-E-P*) is caused by the forward movement of the entire mandible and change in cusp relationship.

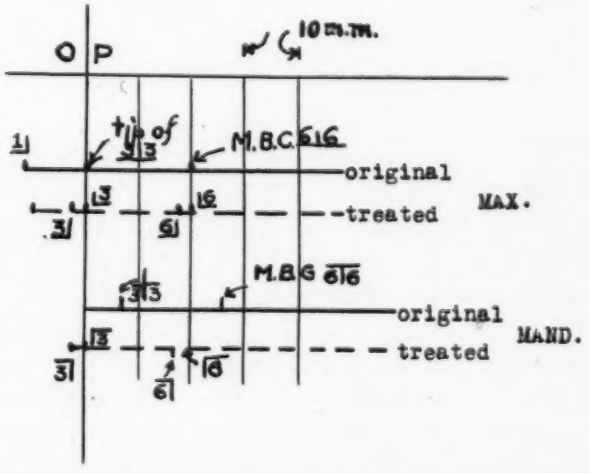

Fig. 3.—Graph representation showing changes in the mesiodistal relationship of the mandible to the maxilla caused by the use of the bite plate. Tips of $\frac{3|3}{3|3}$ and $\frac{6|6}{6|6}$ are shown in relation to the orbital plane. The forward movement on $\underline{3|}$ was caused by wire framework on the plate being forced up in the canine-premolar embrasure.

3. Do not need constant wearing, as a space maintainer, as such, is not required until the space starts to close, which is indicated by the tight fit of the retainer.

4. Can be constructed to maintain function.

5. Can perform more than one purpose.

In conclusion are shown three graphic representations, Figs. 1, 2, and 3, from a practical case, drawn from gnathostatic impressions demonstrating the changes in occlusal height as related to the Frankfort or eye-ear plane and changes in mesiodistal relationship, as related to the orbital plane, which are quite usual with distoclusion (Division 1) cases accompanied by deep overbite.

BITE PLANES

FRED RALPH BLUMENTHAL, D.M.D., BOSTON, MASS.

IN MY practice the removable bite plane plays a very important role. I use it both as a retainer and as an active appliance. It is usually constructed along the general pattern of the orthodox Hawley retainer with a few occasional modifications in such parts as the front section and the clasps as the individual case may require.

Case 1 (Fig. 1) is a typical Angle Class II, Division 1. The case was treated with the usual orthodontic appliances and the mandible was brought forward with intermaxillary elastics and myofunctional therapy to obtain a neutroclusion. Fig. 2, shows the Hawley appliance with a bite plane which was inserted to

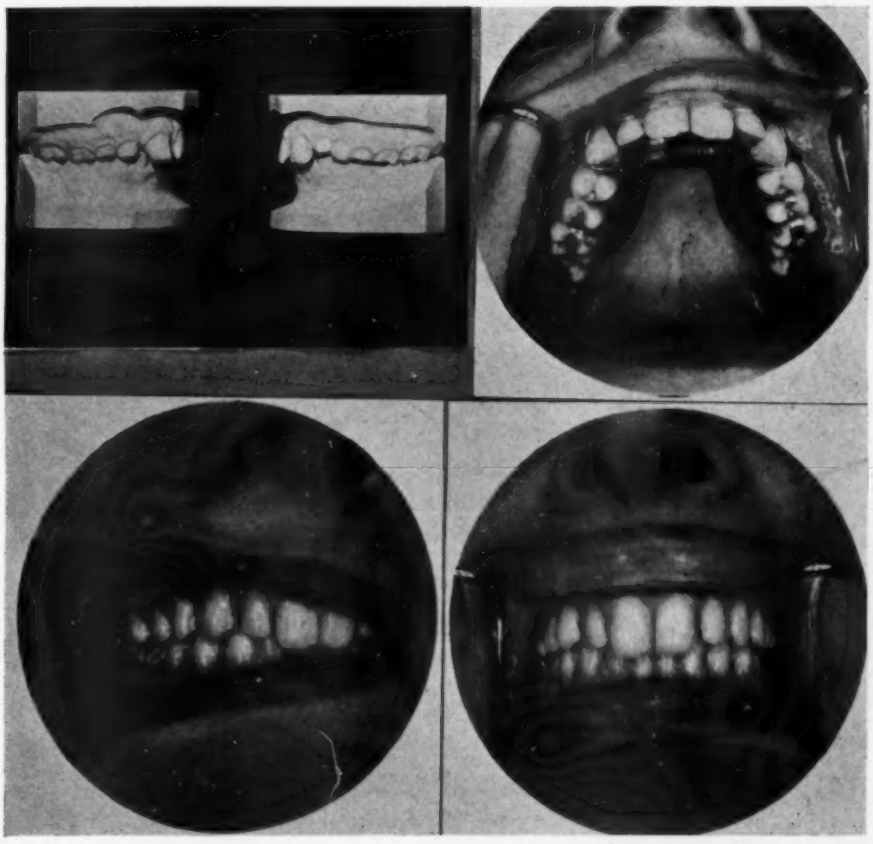

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

retain the mandible in its new position, and Fig. 3, shows a lateral view of the case after treatment. You will note the relationship of the individual teeth and the next figure, Fig. 4, is a front view of the condition long after the retaining appliance had been removed. The appliance in this instance was constructed of dark elastic rubber, yet, as I will show in the clinic, I frequently use the new plastics or castings of vitallium and similar metals.

Presented before The New York Society of Orthodontists, Nov. 14, 1939.

The second case is one which might be classified as Angle Class I, in which we have a very deep overbite (Fig. 5). Note the contact of the incisal edges of the maxillary incisors with the labial gingiva of the mandibular incisors. The case is complicated by the congenital absence of the maxillary left second premolar, the maxillary right first and second premolars, and the mandibular left and right second premolars. The case was started with orthodox appliances.

After the desired development had been accomplished with these appliances, the bite plane was inserted to carry the case further. Fig. 6 shows the bite plane in position. You will notice the removable auxiliary spring which is being used to move the maxillary left first premolar mesially as it had erupted distal to normal. Removable auxiliary springs of this type are used frequently for individual tooth movement. Fig. 7, the case under treatment with the appliance in position, shows the change in the anterior section which I believe was benefited considerably by the bite plane. Fig. 8, the front view of the result obtained, shows the correction of the deep overbite.

Fig. 5.

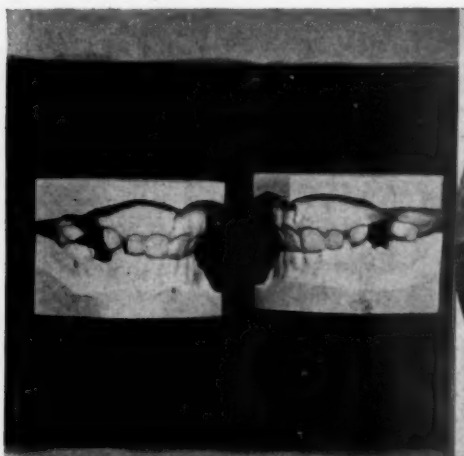

Fig. 6.

Fig. 7.

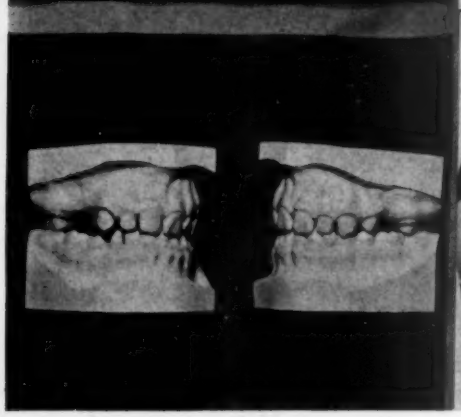

Fig. 8.

The last case is of a girl 19 years of age (Fig. 9). Her case might be classified as Angle Class II, yet she had a dual bite which permitted her to thrust her mandible forward into a neutroclusion. Apparently there were no points of interference to prevent this dual bite. Her mandibular incisors impinged on the soft tissues of the palate causing irritation, pain, and frequent bleeding. The case was further complicated by the congenital absence of the

four second premolars and the loss of the four second permanent molars. She did not wish to wear labial appliances and an attempt has been made to obtain a practical result which would relieve the annoying condition. Fig. 10 shows the appliance which was made of a one-piece vitallium casting and a bite plane of vernonite, which is one of the acrylic resins. The material used in the plane allowed me to change easily its inclination by grinding as found necessary from

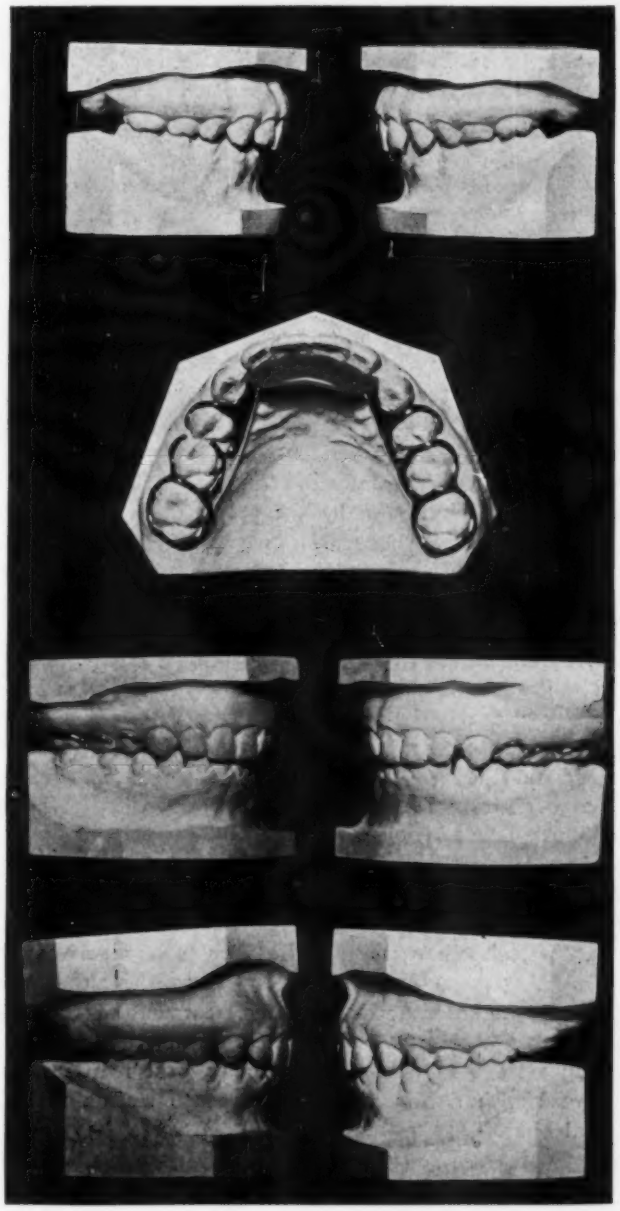

Fig. 9.

Fig. 10.

Fig. 11.

Fig. 12.

time to time. I believe it also caused less trauma and possible wearing of the incisal edges of the mandibular incisors than had the plane been cast in metal. Fig. 11 shows the appliance in position during the progress of the case. Note the change in position of the mandible and the opening of the bite. The clasps are the only visible portion of the appliance. Fig. 12 shows the improvement

accomplished. It is not a theoretically perfect result, but it is a practical and efficient one which has relieved the irritation, pain, and bleeding. The conscientious cooperation of this patient in the use of myofunctional therapy is aiding materially in the successful retention of the result obtained.

DISCUSSION

Dr. Sidney E. Riesner.—This morning we heard the second part of a very elaborate presentation by Dr. Waldron, in which he was the protagonist for the idea of the posterior movement of the buccal segments in considering the treatment of Class II, Division 1 (Angle). This afternoon we hear a presentation of the consideration to bring the mandible forward, in the type of malocclusion, because it is recognized in the treatment of any Class II, Division 1 case, that where we put on a bite plate or bite plane, we are certainly immobilizing the maxillary denture. In the very beautiful example to which Dr. Blumenthal called attention, vitallium clasps on the molars seem to insure rigidity and retention. We all realize that any benefits that accrue are manifestly due to the normal environment and the beneficial influences of normal muscular traction that the bite plane allows. This includes the increase in vertical dimension in the molars and the depression in the incisor region. I was first interested in this about seven years ago when I was taking the temporomandibular joints of cases of Angle Class II, Division 1, that were treated by bite planes. I cautioned men against installing these indiscriminately because of the harmful reaction that might ensue to the temporomandibular joint. That included the articular eminence as well as the condylar head. I had seen such vital evidence of destruction to both these structures through resorptive processes that I thought we should carefully consider our problem before we put these appliances in indiscriminately. This was met by the presentation of a man who used the bite plane quite frequently and he said, "I would like you to follow a case, Dr. Riesner, that I am trying with this treatment exclusively." I took a picture of the temporomandibular joint, and it registered a definite posterior displacement of the condyle head in the mandibular fossa. When the bite plane was placed, I took another picture. The condyle head in that relation was riding right against the articular eminence, which is the position it should occupy when the mouth is opened. Certainly, if function were to start from that point, there would unquestionably be some destructive reaction to either one of the two structures. I was waiting with great eagerness for the opportunity of observing it. About two years later he brought the case again to me after completion of his treatment, and I say candidly it was a very acceptable clinical result; but I silently thought, "Wait until the temporomandibular joint picture is taken, and we will see that many of the points that he believes to be normal are really false, because there probably will be an anterior relationship of that condyle head." But I was amazed, and I must say honestly that the condyle head was setting in as beautiful a normal position as I had yet seen. The only way I could explain that to myself was that he permitted the jaws to be exercised into normal function. That was a very interesting point, and one which follows along the recommended treatment of Dr. Strang of interposing a bite plane during treatment of Class II, Division 2 cases, which would permit freeing of interfering influences during that period of treatment. Since the condyle is nothing more than a mirror of our occlusal relations, we cannot effectively bring the teeth forward with a bite plane and hope to maintain them there indefinitely, because there are dual bites.

May I again take this opportunity of making a plea to check such contemplated procedures in the only accurate way I know, and that is in registering these dual bites by a temporomandibular joint x-ray picture. When you take these models—and I certainly do not mean to impugn the honesty of the essayist—you could very well bring the model forward and relate it and put it in a correct relation and take a picture of it that way, but when you see a picture of the temporomandibular joint in its normal position, and you see a normal occlusal relation, there is no juggling with that evidence.

Another method, if you do not wish to take in the accepted procedure as recommended, probably might be with the x-ray profiles. I believe of course the facts as presented here

by Dr. Callaway and Dr. Hopkins in presenting an oriented model were very important to determine what changes have taken place. It certainly is useful in removing the interfering influences, and as an aid it is unquestionably correct. But, if we are to believe any of the preponderance of evidence that was presented both this morning and the excellent ideas that you have heard before in many parts of the country, and notably presented here in Dr. Strang's philosophy of treatment of the posterior movement of your buccal segments in cases indicating it when they are correctly related to the cranial anatomy, then we have to reconsider these procedures as our initial and prime factor of treatment. Dr. Callaway's reasons are unquestionably valid, and they offer the excuse for a bite plane: maintaining space where a tooth has been lost, maintaining occlusal level so as to prevent the dipping down below the occlusal plane. Those are good reasons for instituting the use of bite planes, but I should certainly not like to see it being interpreted as the ideal form of treatment. There are more important considerations. Perhaps just for the few instances that he has mentioned it is useful.

It was pointed out to me by Dr. Margolis that unless you have the labial arch wire in these bite planes at a lower level than the level of the bite plane, you will not get a retraction of the maxillary incisor teeth but rather a maintenance if not a further protrusion, because you have a two-plane contact so as to get rotation. I hope you will forgive me for turning this thing from just a sterile presentation into one where I have offered a few ideas along the lines that I think can be aided by a temporomandibular joint x-ray picture.

Dr. Stephen C. Hopkins (closing).—I do not think there is any argument between the Atkinson method of moving maxillary posterior teeth back or any maxillary teeth back and the Mershon method of moving maxillary and mandibular teeth back or the Oppenheim method of moving maxillary molars back and bite plane therapy, because they are done in entirely different types of cases. If you think that every Class II case that you see is the same you are very much mistaken. Some of them do require moving back the maxillary teeth, and a great many of them do. I would rather have our case of that type than any other I know because it certainly works out beautifully, but there are other cases where you have to bring the mandible forward, and I would like to dispute that with almost anybody.

THE TREND OF ORTHODONTIC TEACHING AND INVESTIGATION AS A PRIMARY DENTAL CONCERN

Wm. W. Woodbury, D.D.S., Halifax, Nova Scotia

THE way in which orthodontics is being taught in our dental schools and the type of research that is being carried on in this field are very naturally of interest to orthodontists. That it should be a primary concern of the dental profession as a whole, as suggested by our title, may not be quite so obvious. But as there are good reasons why we, as specialists, should consider the subject from a broader angle than that of our specialty, there are equally good reasons why the profession should have a lively concern regarding the development of this branch of dentistry.

The increasing interest being taken by orthodontists in the biologic sciences is the result of a trial-and-error approach to the question of irregularity and malocclusion of the teeth. For many years there was the underlying conviction that given sufficient mechanical ingenuity all orthodontic problems could be solved. There was a sustained search for the perfect appliance. This was the heyday of technical advance, and for a time it seemed to many that there was practically no limit to what could be accomplished by mechanical inventiveness. But the failure to produce appliances that would always bring about the desired movements and assure the maintenance of the teeth in their new positions raised serious questions in many minds. Perhaps no matter how ingenious the operator might be there were conditions that would refuse to respond to his will. Possibly nature could not always be coerced. As it was gradually realized that mechanical ingenuity had brought us to a dead end, it began to dawn that we did not know very much about nature; so we turned our attention to the various branches of biology and embraced this study with growing enthusiasm in the hope of learning something about the conditions we were trying to control.

This shift of emphasis from mechanics to biology has tremendously widened the orthodontic horizon and is reflected in a broader and more logical approach to diagnosis and therapy. The first consideration is no longer what appliance should be used to move these teeth but what is the process here manifest? What is its origin, its trend and its probable outcome? We feel we must know these things if possible in order to decide if or when or how to treat the condition. The fact that many cases do not yield answers to these questions and that we are often compelled to resort to observation and a watchful empirical treatment does not discredit the method. It simply points to our limited knowledge and indicates the need for further study and investigation.

It is of vital importance to orthodontics to know whether the dental schools are cognizant of this change of emphasis and are taking steps to see that the young graduate will not repeat the errors of the past.

Read before the Great Lakes Association of Orthodontists, Dearborn, Mich., Nov. 7, 1939.

And now why should dentistry be especially interested in orthodontics? Primarily because orthodontics has started along a road that the whole of dentistry must travel if it is to move out of its present position of relative impotence. Orthodontics through dire necessity has been led to enlist the aid of the preclinical sciences in clinical practice, thus unconsciously playing a pioneer role in the solution of one of the major problems of dental education. Teachers, practitioners, and investigators in orthodontics have made many mistakes during this period of transition, but there is no question that more and more of them are headed in the right direction. Dentistry has this record before it. It can profit by it, avoiding the mistakes, if it will. It can realize that orthodontics, depending as it does on an understanding of growth, occupies a key position in the dental curriculum in this regard.

It is relatively easy to show students that they must know something about growth and development if they would understand irregularity and malocclusion of the teeth. At the hands of a clinical teacher they learn the necessity of a thorough grounding in the basic preclinical sciences. This is a sound approach, because interest in a clinical subject does not need much artificial stimulation. The student feels when he reaches a clinical subject that he is really studying dentistry. Orthodontics, by sound teaching, can help to habituate the mind of the student to this use of preclinical knowledge and indirectly strengthen the hands of teachers of other clinical subjects, some of which may not exhibit at first approach the same obvious necessity for a thorough preclinical foundation.

If orthodontic teachers and investigators follow their task with energy and intelligence, especially intelligence, for orthodontics has suffered much from unintelligent energy, they can be an important factor in helping dentistry to develop a realistic educational philosophy.

Although for their mutual strengthening they should go hand in hand, the trend of orthodontic teaching is of more immediate significance than the trend of orthodontic investigation. While it is always possible for investigation to produce some startling result that may revolutionize not only our practice but also the whole approach to our problem, the chances of such fruitful investigations being undertaken are multiplied if teaching is such that the mind of the more able student is stimulated and his imagination fired by a true realization of the field.

Before considering trends in either teaching or investigation it is necessary to try to find out what these trends are. This is more difficult than it appears to be at first, especially regarding teaching. The results of scientific investigation are usually available in reports and papers and these can be studied. Teaching is a more illusive matter to assess. The personal equation is always present and always difficult to solve. College calendars do not help one very much. References to the teaching of orthodontics in the dental journals of the past five years are few.

If one could go from college to college and spend enough time in each to get acquainted with teachers and students, and if one were wise enough to ask questions that would reveal what was being taught and thought, an idea of the contribution that orthodontic teaching is making today might gradually

be built up. Even so it would not be a precise picture, for as Weed said recently, "It must be confessed that the measuring rod of educational procedure is inadequate: one deals with impressions rather than with actual data."[1] But for the majority of us this sort of intimate contact is confined to a few individuals in a few institutions.

Attempts to widen an enquiry by less personal methods have serious drawbacks. Apparently many dental educators and investigators cling to the questionnaire as the method of convenience if not of choice. But some of us will agree with Flexner that "the questionnaire is not a scientific implement: it is only a cheap, easy, and rapid method of obtaining information or non-information—one never knows which. No effort has been made to use it in experimental sciences; it is worth hardly more in education, law, and the other social sciences, for words never mean precisely the same things to different persons, and there is no possible way of discounting poor analytic capacity or the practical joker. The post office is, therefore, no substitute for trouble and thought; and it becomes a more and more inadequate substitute as questionnaires increase daily in number, complexity, and size. Human problems can be studied only if information is ferreted out; and to ferret out facts, a trained and educated mind must go to the source, employing all possible tact, knowledge, insight, and ingenuity."[2] However this increase of questionnaires "in number, complexity, and size" that Flexner spoke of does not appear to show much sign of abatement. It is a poor month that does not bring in at least one questionnaire. Some present quite a problem if taken seriously, which we cheerfully confess is not always the case. For example, a questionnaire covering eight pages and listing an even hundred "principles" to be considered invites procrastination at least. In addition one is haunted by the suspicion that the obvious conveniences of the metric system may have unconsciously determined the number of "principles" that engaged the attention of the investigator. Possibly the method ran away with the investigation.

Regarding recent trends in orthodontic teaching a logical starting point would appear to be the Report of the Curriculum Survey Committee of the American Association of Dental Schools published in 1935. At the 1936 meeting of the Association a group conference was devoted to orthodontics at which a symposium on teaching was given and a report presented setting forth the reception accorded the section on orthodontics by teachers of this subject. From a study of this report one gathers that over 60 per cent of the schools had indicated that they had accepted, or were about to accept, the findings of the Curriculum Survey Committee and were making this the basis of their instruction. If this is a fair picture of the condition existing three years ago, it is probably safe to conclude that it has not altered materially in the interim. It was pointed out at that time that the Survey Report seemed to take for granted a more complete understanding of the problems of orthodontics than actually exists. For instance the Report urged that students be counselled to undertake only the treatment of simple cases. "Now there are simple cases which are easy to treat," as one teacher said, "but to recognize them with any degree of certainty is quite another matter. This often requires extensive knowledge which is many times beyond that possessed by even specialists";

so he continued, "Since we are often deceived by what appears to be a simple case, we do not feel that we are justified in presuming to teach undergraduate students along these lines. Otherwise, the student is certain to acquire over confidence and do much damage. On the other hand, the general practitioner has the opportunity of doing a great deal of orthodontics without using appliances."[3] It was further shown that while many of the objectives of teaching as set forth by the Report were acceptable, the actual curriculum suggested tended to defeat them. For example it was stated that the object of the course was, among other things, to teach the student to understand the biologic aspects of malocclusion and to diagnose cases of malocclusion, but an analysis of the proposed curriculum showed that the student would receive "a very heavy dose of appliances both in class and in the laboratory before he knows what the central problem of orthodontics is. It will not be surprising if he concludes that the central problem of orthodontics is the making and manipulating of appliances for the movement of teeth."[4] The ability of the student to diagnose a case of malocclusion had apparently received attention in the Survey Report as an afterthought rather than a central consideration, for it is stated in the section on Clinical Dentistry that, "Data was not obtained regarding the participation of the students in the diagnosis of cases."

It is fair to remind ourselves that the Report of the Curriculum Survey Committee was not promulgated as a finality but rather as a basis for further study and experiment. But it must also be recognized that the Report carries the weight of authority as presumably embodying the considered judgment of the majority of those responsible for teaching orthodontics, and the assent of organized dental education.

It would seem from the foregoing that the treatment of orthodontics in the Curriculum Survey Report has provided a touchstone for the validity of some current dental educational protestations. Organized dentistry through this medium says, in effect—We see that orthodontics is an important dental subject so we will give it a prominent place in the curriculum. We also recognize the significance of the biologic trend in orthodontics, and we agree that students should know something about the conditions that they are going to deal with before they are taught how to deal with them. But the actual curriculum set forth tends to perpetuate the old order. The therapeutic means, of necessity largely mechanical, once more takes the center of the stage. Thus there is evident an awareness of a movement that had something to do with a more fundamental biologic approach, but failure to give it effect shows that it was not really understood, and a check-up a year after publication of the Report revealed over half of the teachers satisfied with this state of affairs and some of them quite enthusiastic, considering it to be a notable advance.

The foregoing developments of the past few years indicate a heightened interest which is stimulating, and certain encouraging symptoms may be noted. One is the anxiety shown by some teachers to make orthodontics more helpful to the dentist in his everyday practice. Compelled to broaden the etiologic and diagnostic approach, some have been led to see that the exacting technique which characterizes much orthodontic therapy can in the nature of things be applied to only a fraction of the cases needing attention. There may be good

orthodontists within these limits, but are these limits broad enough? Is orthodontics making the contribution to dentistry that it is capable of making?

There are so many unsatisfactory angles to active student participation in an orthodontic clinic that many teachers who have been influenced by the reorientation of orthodontic thought discussed above have discontinued this type of teaching as doing more harm than good. We are convinced that this has been a sound move. The time at the disposal of orthodontics in the curriculum can be more fruitfully employed. It is in line with the thought of many educators. One of them has told us recently that "The dental schools of America have insisted that their students acquire in the four-year curriculum all of the technical proficiency needed for immediate practice. The dental schools provide biological courses in the preclinical medical sciences for roughly one and one-half years of the four-year course; then, in spite of sporadic efforts at reform, the school superimposes two and one-half years of the most rigid technical discipline. No wonder that the scientific interests of the average dental student in the biologic and medical aspects of his great subject do not survive. The number of dental teachers who still maintain the spirit of investigative curiosity, except as to technical method, is woefully small." And he adds that this teaching programme "has produced a technical perfection which is not being applied, and cannot be applied, to the whole population."[1]

Some teachers of orthodontics who are thoroughly dissatisfied with the traditional student clinic but are concerned with the social implications just noted are still looking for a solution to this complex problem. Moore has undertaken an interesting experiment at the University of Michigan. We are told that each student is given actual contact with five patients over a three-year period from the first semester of his sophomore year to his graduation, and during this time the emphasis is placed on the significance of growth, correct diagnosis, an understanding of etiology, so far as it is known, in order to prevent, and the promotion of "honest professional service by teaching the student to recognize and admit his limitations."[5] Nothing will demonstrate more clearly that this is an orthodontic student clinic with a new approach than to be able to report at a future time that some of these children have run the gauntlet of a close intelligent three-year observation without treatment. Dr. Moore hopes that this "will be a forward step toward meeting those public demands for orthodontic service which can be satisfied only by the general practitioner." In the spirit of the "progressive case reports" that have become a feature of the proceedings of this society, we shall look forward to hearing how this "case" progresses while under "treatment."

Another member of your society, Dr. Corrigan, is doing an interesting piece of work at the University of Toronto. This was reported to you three years ago.[6] In a clinic conducted with the cooperation of the public health authorities and for teaching purposes housed in the dental school, orthodontic problems are being approached from the angle of the general practitioner. The children are all quite young thus giving an opportunity to study the dental changes attendant upon growth, and, when treatment is indicated, simple means are employed.

A recent suggestion that the teachers of orthodontics band themselves into a separate organization, while exhibiting a laudable desire to study common

problems more intensively, is of doubtful wisdom from the wider viewpoint that we have been considering. There is good reason to believe that it would tend to segregation rather than cooperation and thus encourage within the profession a condition similar to that from which dentistry itself has suffered in the larger health field. There has been some tendency for general practitioners to look upon orthodontists as a self-appointed esoteric coterie of super-technicians who consider themselves a bit apart, and orthodontists have not always been at pains to disprove this indictment by their attitude. If we try to reach beyond our more or less self-imposed boundaries and seek to make our contribution along with dentistry as a whole, we will probably be more effective. Enlightened thought in dentistry itself realizes that the profession is hampered by a too limited outlook; that it is in reality part of a larger field. Anderson of Yale said recently, "You cannot compare dentistry with medicine, but only with a branch of medicine (as ophthalmology) for it is medicine," and regarding the respective provinces of these professions he has said, "The fields of dentistry and medicine have, of course, never been separated. It is only the physician and dentist that have drifted apart."[7]

Up to this point the most important factor in teaching has not been mentioned, and that is the teacher himself. In his recent book, *The American State University*, Foerster says, "Once the right students and the right teachers are brought together, most of the perplexities of education are quickly simplified," and he defines the right teacher as one who "having managed to educate himself liberally (he) maintains in his thought, study, and teaching a vital relationship between his special subject and other subjects and indeed the whole encyclopedia of knowledge." Such a teacher "expects the student to acquire a substantial body of facts, only the facts must be reflected upon and used, not merely learned. Like the specialist, he offers the thrill of discovery: not the discovery, however, of something never before known by anyone, but simply the discovery of something never before known by the student, some principle, some point of view, some relationship that opens up a new domain of experience or throws a flood of light upon a multitude of facts previously obscure or inert."[8] This paramount importance of the right sort of teacher was emphasized by Weed when he said, "I often quote a remark made by the late Professor Halsted at the end of a long and acrimonious debate over the required course: 'The only way to arrange a curriculum is to give the good teachers what they want and to take away the hours from the poor ones.' "[1] Such teachers are not to be had for the asking, and this constitutes one of the main concerns of the educational executive.

The transition from teaching to investigation is a natural one, for the ideal condition is that they should go hand in hand. John Hunter, who in the eighteenth century contributed so much to our particular interests, was a brilliant embodiment of this happy combination. Sir James Paget, writing in 1897, said, "The influence of Hunter may be observed in a comparison of the progress of medical science and practice in the present and in the last century. It is impossible to tell how much of the change may be due to him; but the increase of accurate scientific observation, and the reliance on it rather than on theories, are clearly in accordance with his rule of study." And speaking

of this "rule of study" and the way in which Hunter, the investigator, was influenced by Hunter, the teacher, Paget says that "Till he came to the teaching of other students, Hunter probably never taught himself any of the rules of scientific study. . . . For he saw the right method, and when he wanted to teach it he told it in words, quoted in Baron's *Life of Jenner,* 'Don't think, try; be patient, be accurate;' plain words still useful in the whole range of medicine and of knowledge relating to it. . . . Hunter's rule may be well used in the promotion of all science. It so often seems safe to believe that by careful thinking over the facts already found and even repeatedly tested and confirmed, we may be able to think of others which appear naturally to follow them, and thus, by thinking, to enlarge our knowledge. But the history of science may teach that this is rarely safe; and that every 'thinking' must be 'tried' patiently and carefully, by experiment or repeated careful observation, before it can be safely accepted as truth. Hunter held by this rule. He did indeed think; he spent long times in only thinking; but we may believe that in many of these long times his conclusion was that in thus thinking he was tempting himself to the wrong way, and that, at most, it could only suggest how he should patiently and carefully 'try' what he had been led to think."[9]

This close association between teaching and research was emphasized last summer by Lord Tweedsmuir when addressing the University of Edinburgh, as its newly elected chancellor. He said, "A university has two plain duties. It has to transmit knowledge, and it has to advance knowledge." After making a plea for an underlying foundation of a broad humanism he continued, "The instruction of a university must be in the general principles, the fundamental propositions, the theory, of any discipline. It cannot profess to teach the practice of a profession, for it cannot keep step with its rapid changes." Then turning to research and its close association with teaching, he said, "The two duties are closely united, for unless they have a center of creative thought behind them the various professions for which we train our youth will become stagnant and blind."[10]

Until recently most of the research carried on in dentistry, including orthodontics, was nonbiologic, the properties of various materials used in the art; necessary investigation but limited in scope and reflecting the prevailing interests of the profession. As was to be expected, the shift of emphasis we have been considering has raised questions of a different order. A good deal had been learned about fabricating materials and manipulating appliances to move teeth, but very little about growth and its oral manifestations and the etiology of its disturbances.

When the significance of growth first took hold of the imagination of orthodontists it was taken for granted that each individual was capable of satisfactory dental development if given proper nurture. Unconsciously based on a naive philosophy of an inherent physical perfection that only needed suitable surroundings, natural or therapeutic, for its realization, this exclusive interest in environmental causes reflected the common dental educational background. Fortunately we are getting away from this highly doctrinaire attitude that for years decreed that environment was the sole area in which the etiologic factors of malocclusion must be found.

One of the most promising trends in orthodontic investigation is the growing interest in genetics and in the hereditary factors of development. Brash suggested a decade ago that this approach to etiology was long overdue. Johnson's reports from time to time of the work being done at the Cornell Morphological Farm, and especially his demonstration of the clinical application of some of the findings have added to the significance of this study.

Another encouraging tendency is the interest in what has been called the longitudinal study of development. Until recently studies of oral growth and development have usually been carried on by collecting data concerning groups of children at different age levels, averaging the results for each age group and then studying this sequence of the averages. This is useful as a study of averages and for building a background of expectancy, but averages do not exist in the real world; the patient whose case has to be diagnosed is not an average but an individual, and it is becoming more clearly realized that there is so much variation in rate of growth and even in sequence of development as between different individuals, that the sort of statistical study referred to can only indicate a general trend. So individuals are being studied at different stages in development. It is time-consuming work which does not produce rapid results but yields the sort of information that is badly needed. Hatfield pioneered this sort of observation years ago, and among others, Lewis and Lehman and Waldo have reported similar progressive studies. Howard's work in the cognate field of endocrine imbalance is an undertaking that is suggestive, especially his more recent observations regarding mesioclusion cases.

Apropos of the famous Hunterian aphorism, "Don't think; try," the English physician, Sir Walter Langdon-Brown, tells of a rather cynical friend of his who one day remarked that "out of respect to John Hunter the medical profession for more than a century had been trying not to think." And Sir Walter says that although we realize that Hunter was merely advocating experiment rather than speculation, there is a sting of truth in the comment.[11] If our understanding were more complete, changing emphases would not be so necessary, but with our limited yet expanding knowledge they are inevitable. We have noted not only Hunter's emphasis on patient observation but more recently and in our own field the unfortunate and rather prolonged attachment to mechanics and technique, and along with this the almost exclusive interest in environment. Then we have seen the still more recent and more encouraging emphasis on growth and genetics, and the study of the individual, without which therapeutic measures can never be put on a sound foundation.

In closing I am going to suggest that at the present moment our chief concern should be regarding teaching and teachers, especially teachers. If our students are led by teachers who comprehend the field, who are broadly educated and endowed with scientific curiosity, and who understand and are sympathetic toward expanding minds, such problems as curriculum and investigation will gradually take care of themselves.

Addendum

Following the presentation of the foregoing it was suggested that a remark that was made by the writer during the discussion should have been incorporated in the paper itself. This was that "an interest in the biologic approach is no excuse for sloppy technique."

Growth or its aberrations may effect unpredictable changes during the course of any treatment, and it is impossible to know precisely how much of the change that is taking place during treatment, be it desirable or otherwise, is due to the operator and how much is due to nature. When changes occur that are undesirable it becomes the duty of the conscientious operator to face the matter as uncompromisingly as possible as he endeavors to find out how much is due to factors over which he has no control and how much may be laid at the door of his poor judgment or unskillful manipulation. Only the lazy operator will lightly blame nature for his own mechanical inefficiency.

However there is another side to this picture; for the man who clings to the traditional orthodontic concept that the central problem of orthodontics is a mechanical one may, in his determination to reach a morphologic ideal, unwittingly attempt to oppose growth tendencies quite beyond orthodontic control, thus subjecting his patient to an unnecessarily prolonged and relatively fruitless treatment.

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ORTHODONTIC PHOTOGRAPHIC RECORDER

Use of Cephalo-Phore and Miniature Camera for Standardized Facial and Dental Photographs

Bercu Fischer, D.D.S., New York, N. Y.

A GREAT deal has been written about the importance of facial and dental records in orthodontic practice. Since the early days of the specialty the orthodontist has felt the need of being able to record permanently, the original condition of the face and mouth of the patient under his care. The plaster casts and facial mask came early under his use. However, the long time consumed and the inconvenience to the patient in making facial masks, made him look for other methods; and photography seemed to answer his needs much better.

Photography, however, brought with it new problems that had to be solved; not the least of which was standardization. To obtain standardized facial photographs it was necessary to immobilize the object in a definite relation to the camera and to be able to reproduce this relationship at will. It also required a fixed distance between object and lens and constant lighting conditions. Many forms of photographic equipment have been presented to the profession; however, it was not until the introduction to this country of Simon's photostatic method, that standardized facial photographs replaced the former snapshots.

Another problem that had to be solved was bad perspective. The old style photographic camera, with bellows extension limitations and large size negative, necessitated a greater working distance, with resultant bad perspective at shorter distances; and made the installation of photographic equipment difficult for the orthodontist with average office space.

With the introduction of the miniature camera, however, it became possible to photograph objects at much closer distances. In an article by Golden published in the International Journal of Orthodontia, he described a method in which he used Simon's photostatic technique and the miniature camera and with good perspective, reduced the distance between object and lens to thirty inches.

By means of the orthodontic photographic recorder that I am about to describe, I am enabled to produce standardized facial photographs and though the distance does not exceed thirty-two inches, the perspective is good. In the technique employed the cephalo-phore (or head-positioner) and miniature camera are used. The head is related to the camera by means of the cephalophore, which is not removed while the photograph is taken. On this cephalophore the eye-ear and median planes are fixed in a definite relation to the camera, while the orbital plane is adjustable to the individual case. These planes are registered directly on the film at the time the exposure is made and not drawn in after the film is processed.

Read at the meeting of the New York Society of Orthodontists, Nov. 13, 1939.

Before describing the apparatus and technique, I should like to point out one phase of photographic recording that has not received the attention it deserves.

While most orthodontists came to recognize the importance of facial photographs and these in a good measure replaced the facial mask, the plaster cast remained the only means of recording the dental condition. Decalcification of enamel and stains on teeth, as well as soft tissue disturbances, do not register on the white plaster. These stains and defects of enamel are very often forgotten by the parent or patient when teeth are covered for any length of time with bands during treatment. When the bands are removed at the end of treatment the patient often shows surprise at seeing these defects or stains.

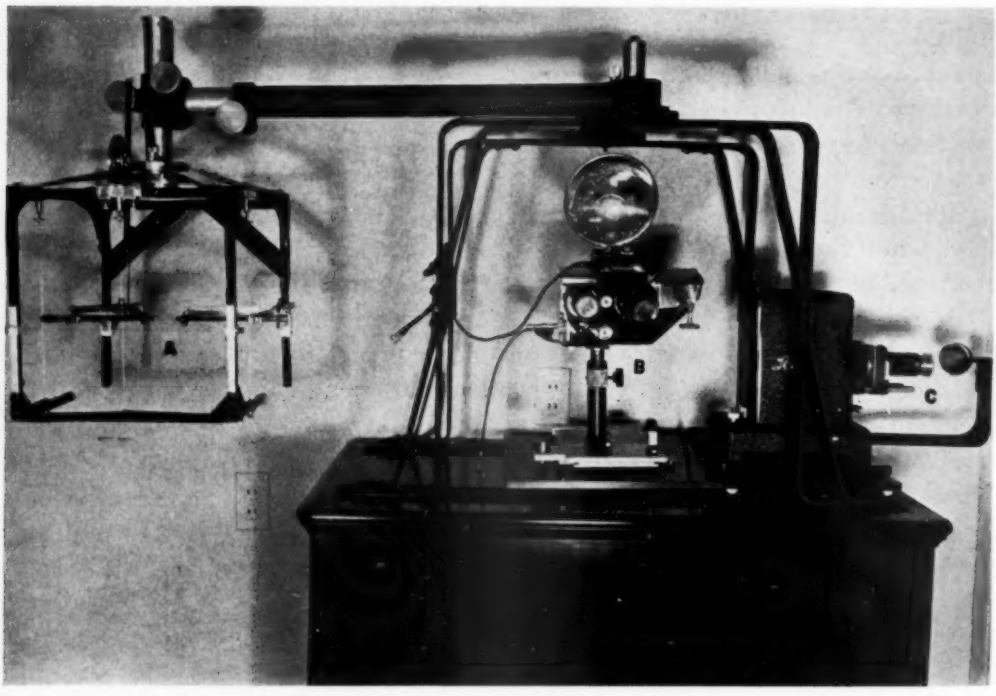

Fig. 1.—Orthodontic photographic recorder: *A*, Cephalo-phore; *B*, Photographic unit; C, Projector.

The reason that the dental photograph was neglected may be found in the limitation of the camera with one lens and partially to the fact that black and white photography had very little more to offer than the plaster cast. With the introduction of the miniature camera and its interchangeable lenses and the advent of color photography, it is possible to obtain a permanent color recording of the dental tissues at the beginning of treatment which will clear orthodontists from the unjustified accusations in many cases, that these disturbances were caused by treatment.

DESCRIPTION OF EQUIPMENT

The equipment consists of three parts.

1. The cephalo-phore.
2. The photographic unit.
3. The projector.

The cephalo-phore consists of a cube-like frame. Each edge is one foot long and calibrated in $\frac{1}{32}$ of an inch. The front face of the cube is divided vertically in two equal halves by means of a wire which represents the median plane. Other vertical wires are attached to sliding tubes, in the lateral faces of the cube. These wires represent the orbital plane and can be adjusted and fixed to any graduation on the calibrated upper and lower bars. A horizontal wire running through the front and lateral faces of the cube, represents the eye-ear plane and can be adjusted to form a perfect horizontal plane, at any height from the base and fixed in that position.

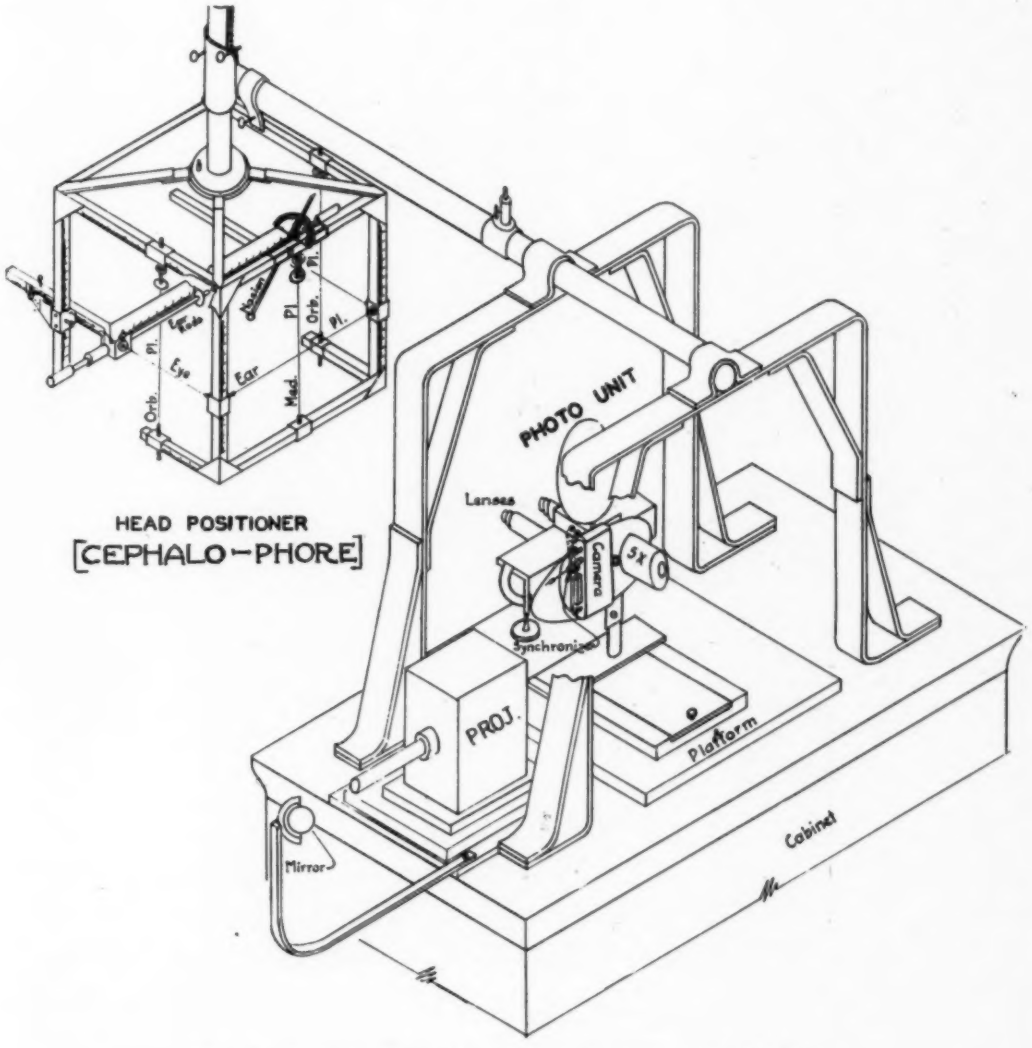

Fig. 2.—Orthodontic photographic recorder. Line drawing.

The wire representing the median plane coincides with a vertical line on the ground glass of the camera, when frontal photographs are taken. The wire representing the orbital plane, coincides with the same vertical line of the ground glass, when profile photographs are taken. The wire representing the eye-ear plane, coincides with a horizontal line on the ground glass.

Sliding through sleeves on the posterior vertical bars are two calibrated square pieces of metal, which can be adjusted at any distance from the front. These bars carry the ear rods, which are also adjustable by means of graduated slides, to the needs of each patient. Attached to the upper bar of the front face, is the nasion indicator. This indicator can be adjusted to the nasion point on the patient and fixed in that position. By means of the graduations on it and a calibrated dial upon which it rotates, any position of the indicator can be recorded and reproduced. The entire cephalo-phore swivels in a complete circle, on a special attachment and can be fixed every 90° by means of a tapered pin.

Fig. 3.—Apparatus oriented to the chair: *A*, Black line inserts in the floor covering; *B*, pointers on cabinet to facilitate positioning.

The photographic unit consists of a rotating stage copying device, the front plate of which carries two lenses. On the rear plate, which rotates on a pin, is attached the Leica camera and ground glass with a 5 X wide field magnifier. On the ground glass two lines are drawn perpendicular to each other, marking the lens axis. The horizontal line coincides with the wire on the cephalo-phore, representing the eye-ear plane. The vertical line coincides with the vertical wire on the cephalo-phore, representing the median plane in front view and with the

wire representing the orbital plane in profile. Attached to the camera is a photoflash synchronizer. The flash bulb and reflector are fastened to a specially designed stage that can be tilted to any angle desired. Two positions are used; the vertical for dental photographs and the tilted for facial photographs. The copying attachment together with the camera, lens and photoflash synchronizer, is fixed on a platform by means of a rack and pinion and can be moved from side to side, anteriorly, posteriorly and up and down. The horizontal plane of the platform is adjustable. The photographic unit and cephalo-phore are held in a fixed relationship by means of a horizontal bar. The cephalo-phore and bar can be turned away when not in use. The whole arrangement is fixed on a cabinet which can be moved in position when in use.

A slide projector is mounted on the same cabinet and by means of a mirror, a spotlight is produced on the subject for focussing. This mirror can be moved out of the way when slides are projected.

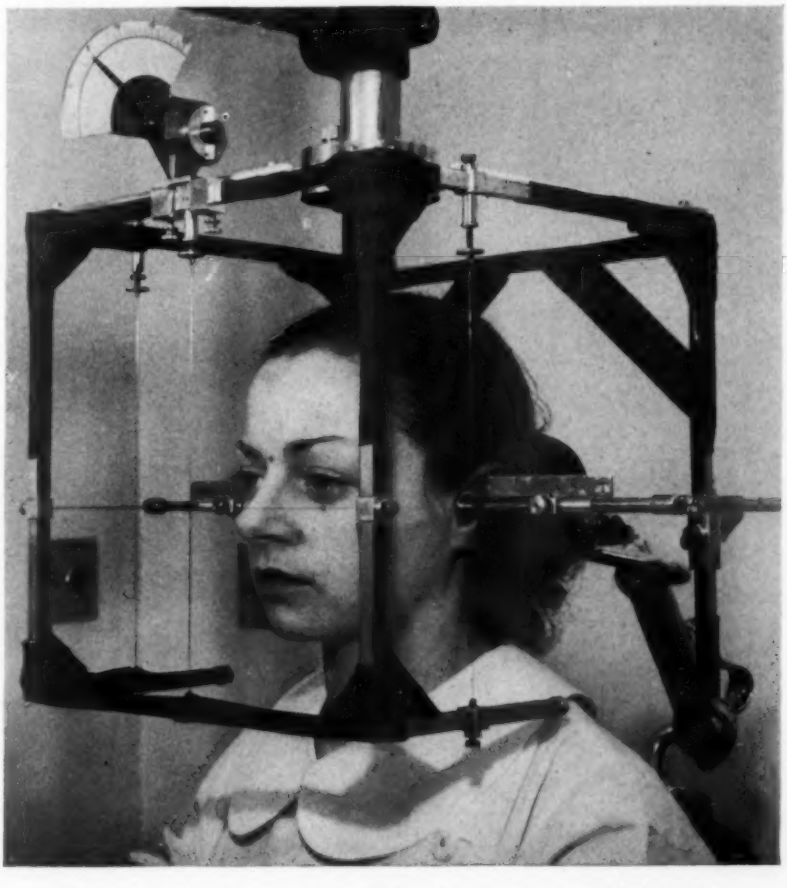

Fig. 4.—Cephalo-phore in position for front view photograph.

PROCEDURE

For front view facial photographs the apparatus is oriented to the chair, by means of black line inserts in the floor covering. The patient is seated in the chair and raised into the cephalo-phore, until the ear rods are on a level with the ear holes and will slide into them without binding. These ear rods are

guided into the ears until an equal reading is obtained on the graduated right and left scale. The head is automatically positioned in the center of the front face of the cephalo-phore and any slight deviation of the median line, can now be corrected by means of the vertical wire of the cephalo-phore. The chin is raised or lowered as the case may be, until the orbital points which have previously been marked on the face, will fall on the wire representing the eye-ear plane. When the front face is viewed through the 5× magnifier over the ground glass, the orbital points on the face, the horizontal wire of the cephalo-phore, and the horizontal line on the ground glass must all coincide. Any deviation will be shown on the ground glass, magnified five times; this is also true of the median line. It is this arrangement that makes it difficult for any error to creep in, in the positioning of the head in its relation to the camera. The camera on the rotating stage is brought in position over the lens and the exposure made.

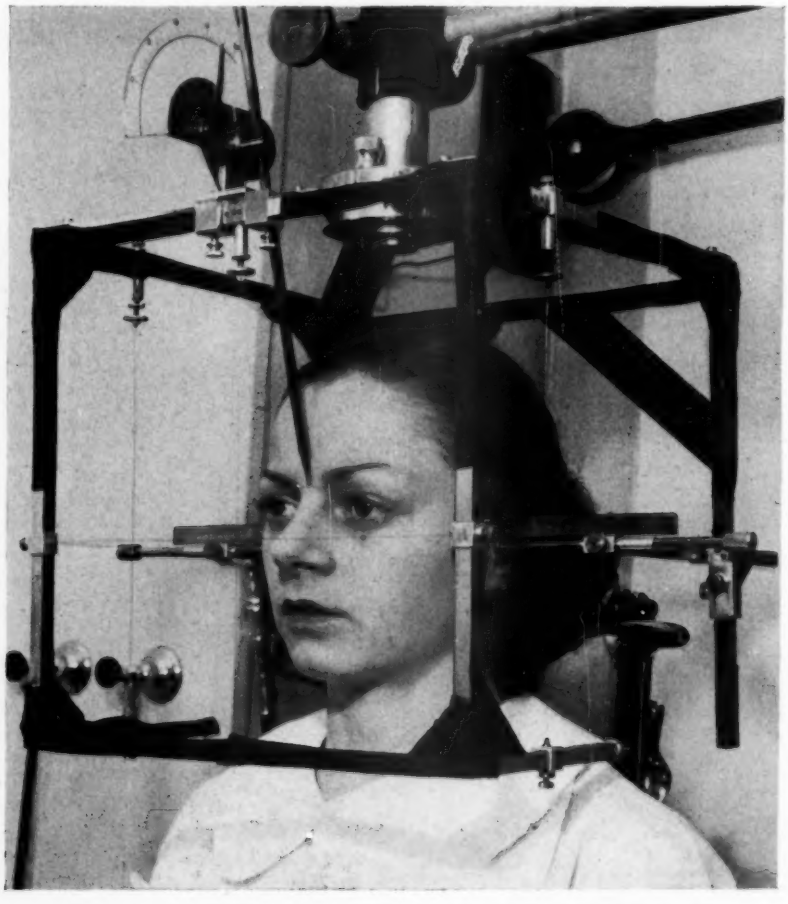

Fig. 5.—Cephalo-phore in position for profile photograph.

For the profile photograph the chair and cephalo-phore are rotated 90°. The ear rods are replaced to former readings. The left orbital wire of the cephalo-phore is moved, until the left orbital point falls in the intersection of this wire with the horizontal wire and coincides with the intersection of the cross lines on the ground glass. When the head is in the proper position, the

nasion pointer is adjusted to the marked nasion point on the head. The camera, on the rotating stage is again brought over the lens and the exposure made. Before disturbing the position of the apparatus and patient, the readings on the cephalo-phore are taken and entered permanently on the patient's chart for later use.

For the dental photographs the cephalo-phore is moved to one side, the tilting stage supporting the flash bulb is moved to an upright position and the focussing done on the ground glass, which is now opposite the second lens. The camera again is brought into place and the exposure made.

SUMMARY

In summing up, the following essential points of the apparatus and method may be stated:

1. The cephalo-phore and miniature camera with two lenses are used. The use of two lenses of different focal length enables the operator to take facial and dental photographs from the same distance. In some cases the dental photograph is more important than the facial.

2. The use of the flash bulb standardizes lighting and eliminates flood lights, a desirable feature in photographing children.

3. The compactness of the apparatus and the small space necessary for its operation, make it practicable even in the small operating room.

Fig. 6.

Fig. 7.

Fig. 6.—A front view of the face on which the median plane and the eye-ear plane were registered directly on the photograph when it was taken.

Fig. 7.—A profile photograph taken with the use of the nasion indicator. The eye-ear and orbital planes are registered on the photograph, and the orbital point is in the intersection of the two planes.

4. The speed of $\frac{1}{200}$ of a second, eliminates blurring of pictures due to movement.

5. Through the use of Kodachrome film, color slides are obtained which are a true reproduction of conditions as they are and are invaluable in the presentation of cases.

While the method described follows Simon's photostatic technique, the following is worthy of special notice:

6. Through the use of the cephalo-phore, the immobilization of the head in relation to the camera is insured and this relationship reproduced at will.

7. The repositioning of the head is accomplished by means of ear rods and nasion indicator. This reduces considerably the error in the replacement of the landmarks on the face.

8. The photographs obtained are used as a record of the face at the beginning of treatment and for comparison after treatment. Furthermore such photographs are invaluable in our study of the face and its abnormalities and for this purpose the front view is as important as the profile.

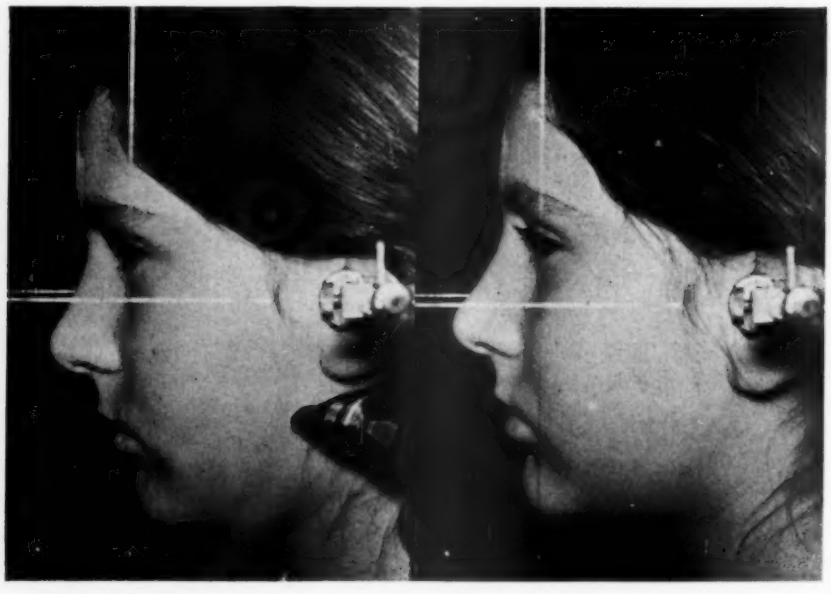

Fig. 8.—Two photographs taken of the same patient at the same time without changing the position of the orbital point on the face. In the photograph on the left the patient's head was tilted downward slightly until the orbital point was below the eye-ear plane of the cephalo-phore. In the photograph on the right the head was tilted slightly upward until the orbital point was above the eye-ear plane. The total distance between the two points was less than 6 mm. in natural size enlargements. Observe the position of the chin in each photograph. In the photograph on the left the chin is in back of the orbital plane and in the photograph on the right the chin is in front of the orbital plane. This shows the great care that must be exercised in the making of photographs and especially in their interpretation.

Fig. 9.—Four photographs taken of the same patient at different times. The orbital point was used as a landmark for orientation and was replaced every time. No nasion indicator was used. The four photographs look identical; yet when the photographs were enlarged to natural size and tracings made, the variations were quite marked. Number *1* represents the first photograph taken and *2*, *3* and *4* the sequence of the photographs. The error is 1.8 mm.

Fig. 10.—Four photographs of another patient, taken at four different times. The orbital points were adjusted only for the first photograph. The photographs *2*, *3* and *4* were made without replacing the orbital point but by using the nasion indicator and adjusting the cephalophore and the nasion indicator to the readings taken at the time the first photograph was made. The variation is shown in the tracings which were made under identical conditions as the tracings shown in Fig. 9. The error here is only one-half of a millimeter.

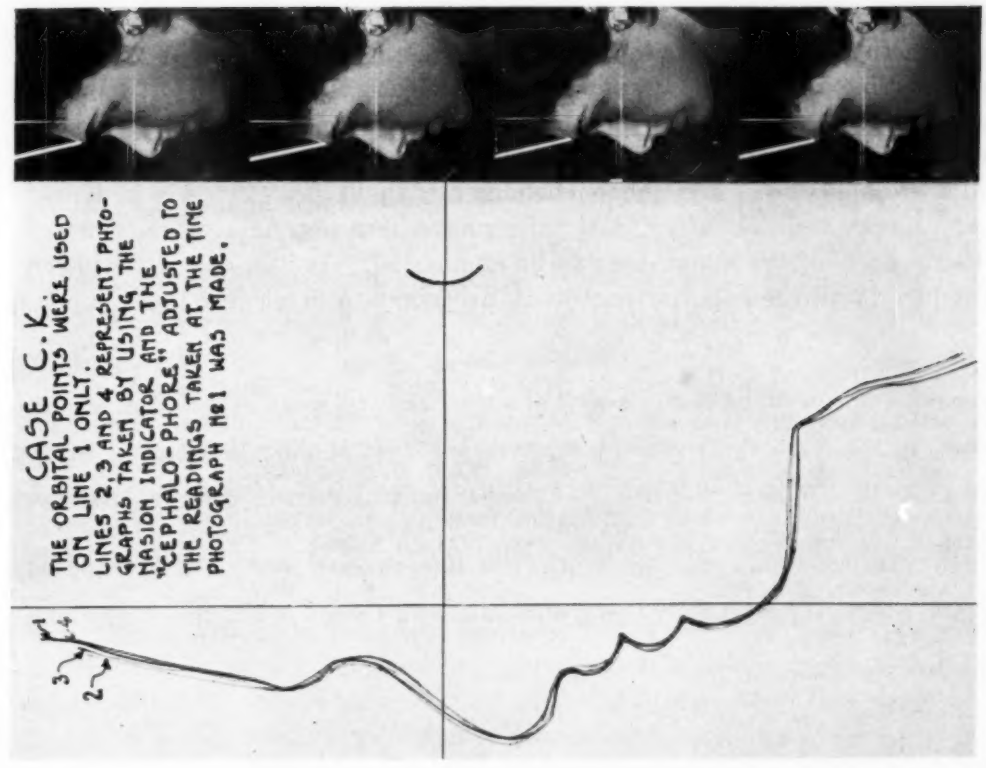
CASE C.K.
THE ORBITAL POINTS WERE USED ON LINE 1 ONLY.
LINES 2, 3 AND 4 REPRESENT PHOTOGRAPHS TAKEN BY USING THE NASION INDICATOR AND THE "CEPHALO-PHORE" ADJUSTED TO THE READINGS TAKEN AT THE TIME PHOTOGRAPH NO1 WAS MADE.
1
2
3
4

Fig. 10.

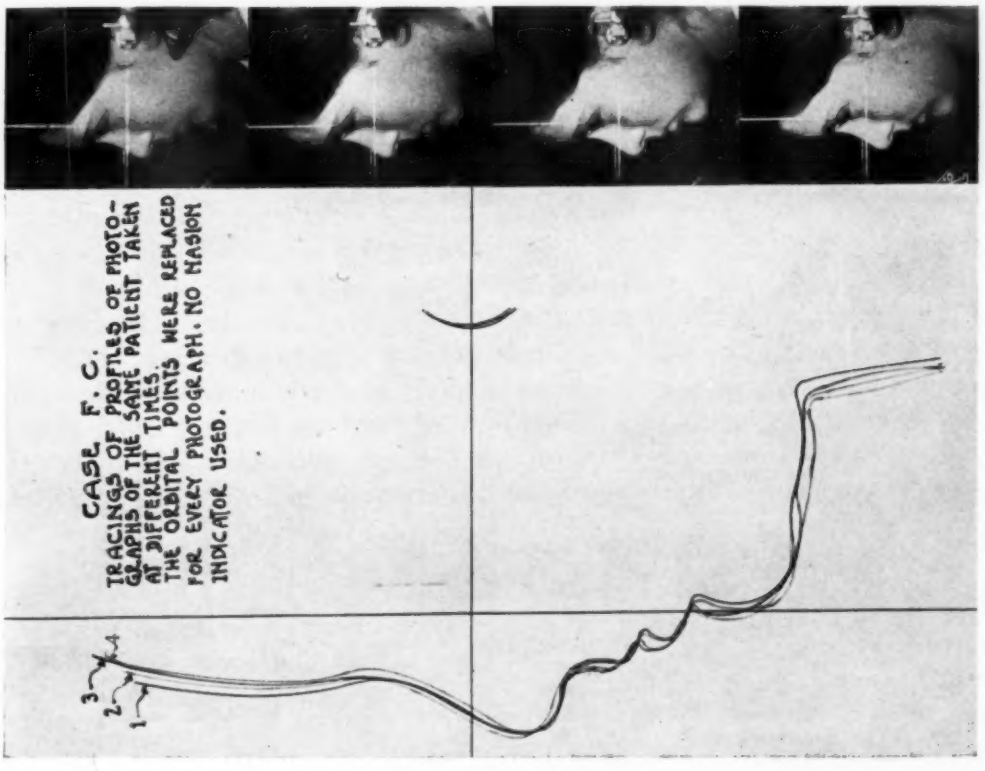
CASE F. C.
TRACINGS OF PROFILES OF PHOTOGRAPHS OF THE SAME PATIENT TAKEN AT DIFFERENT TIMES.
THE ORBITAL POINTS WERE REPLACED FOR EVERY PHOTOGRAPH. NO NASION INDICATOR USED.
1
2
3
4

Fig. 9.

(See facing page for legends.)

9. Photographs to be of any value for study and comparison must be standardized and must be oriented.

The method described is capable of producing standardized photographs, and orientation of the photographs for comparison is accomplished by means of various lines registered on the photographs. These lines are registered directly on the film, at the time the exposure is made, and not drawn in after the film is processed. And in conclusion, I wish to say that this is a preliminary report and that after fixed values have been determined many of the adjustable parts of the apparatus can be eliminated. As it is now, it has been designed to do all the experimental work necessary to determine these values.

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2 EAST FIFTY-FOURTH STREET

PUBLIC RELATIONS BUREAU PREPARES NEW LEAFLET ON ORTHODONTICS

ON Dec. 4, 1939, the executive committee in charge of the work of the Public Relations Bureau held one of its many meetings of the year. The special significance of this occasion was that its chief business was to put the finishing touches on a leaflet which is planned to be the major activity of the first year's work.

It would seem to be a simple matter to prepare such a document. But when it is remembered that the committee is breaking new ground and wishes to be secure in each step, the matter assumes different meaning. So a group gathered in New York City at 1 P.M. and stayed through until 9:45 before the job was completed. And, several weeks previously, the committee had met for a week-end in a Long Island country home, but had found the task too great to be accomplished in one session.

"Facts About Orthodontics for Health Workers" is now available singly and in quantities. It is in question and answer form, simply stated, easily read. Some of the questions which inquiry showed were uppermost in the minds of health workers were difficult to answer in a way to be easily understood. The committee wrestled with these problems and hopes that the document which has resulted from their efforts will meet with general approval.

Distribution is recommended among the same groups that were approached with the reprint of the article, "Make Way for Even Teeth." Members of the Association are urged to obtain copies and get them into the hands of health officers, public health nurses, nutritionists, executives of voluntary health organizations, such as tuberculosis associations and mental hygiene committees, school administration authorities, school physicians, pediatricians, Parent-Teacher Association officers and vocational advisors.

Send for copies to Mr. Dwight Anderson, Director, Public Relations Bureau, American Association of Orthodontists, 2 East 103rd Street, New York, N. Y.

The committee reports that the supply of "Make Way for Even Teeth" is almost exhausted. Members wishing to obtain copies should send for them at once. The response obtained by sending these reprints to important workers in the health field fully justified the effort. Letters expressing appreciation of the need for work of this sort came from many places throughout the country.

Erratum

On page 1162 of the December, 1939, issue of the JOURNAL in the article, "Some Physical Properties of the Labial Expansion Arch," by Dr. Peter Adler the last formula should read:

$$\frac{P_t}{P'_t} = \frac{a\ [n^2 + (a - m)^2]}{(a - m)\quad (a^2 + b^2)}$$

Department of Oral Surgery and Pathology

Edited by

STERLING V. MEAD AND KURT H. THOMA

Articles on oral surgery, radiography, and anesthesia should be submitted to Dr. Sterling V. Mead, 1149 Sixteenth Street Northwest, Washington, D. C. Articles on oral pathology should be submitted to Dr. Kurt H. Thoma, 53 Bay State Road, Boston, Mass.

THE IMPORTANCE OF THE HISTOLOGIC PICTURE OF OSTEOMYELITIS OF THE JAWS FOLLOWING THE EXTRACTION OF TEETH FOR TREATMENT

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TOOTH extraction is a unique treatment in a peculiar sense. The tooth is an organ which, during the extraction, is forcibly removed from the jaw. Since the mouth cavity is never free of microorganisms, there are acute and chronic inflammatory changes in the supporting bone around the root end which must be considered as a localized osteitis. The extraction process produces more or less extended fractures into the bordering bone trabeculae which wall off large bone marrow cavities. This is especially true in the region of the mandibular molars. By this mechanical action blood vessels are opened and not infrequently surgical interference becomes necessary to remove splintered tooth rests. However, in spite of these unfavorable conditions the healing of the majority of extraction wounds proceeds uneventfully.

The undisturbed healing of extraction wounds was studied experimentally by various investigators, and it was determined that this process corresponds on the whole to the tissue changes in bone repair, or to be more precise, in the organization of a blood clot traumatically produced in the bone. The presence of an epithelial wound and the fact that more or less remnants of the periodontal membrane remain within the socket, give the healing of extraction wounds a particular note. It is beyond doubt that this repair of a jaw wound is influenced and governed by the function if a bacterial infection is prevented. The investigators who have dealt with experimental studies of undisturbed healing of extraction wounds in dogs could not agree with each other in regard to the time which determines the various stages of the healing process from the blood clot to the complete filling in with new bone. The dispute seems to be superfluous since every healing process depends upon many individual constitutional and local conditions. The experimental microscopic investigations and histologic studies of healing of noninfected extraction wounds in man conducted by Steinhardt[1] and Claflin,[2] as well as my[3] microscopic examinations of extraction wounds in human jaws, confirm the importance of a rapid, undisturbed, and complete epithelization of the surface to protect the regenerative processes. On

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the other hand, proper epithelization depends upon undisturbed regeneration in the jaw. I do not believe in the importance of periodontal membrane remnants retained on the walls of the socket to support bone development. On the contrary, they seem to delay healing.

More attention should be called to the process of extraction wound healing disturbed by a bacterial infection due to an acute or chronic periapical infection, since this disorder may give rise to the development of osteomyelitis of the jaws. It is this subject with which I wish to deal.

This problem has also been approached experimentally by Meyer[4] and Claflin.[2] Particularly, Claflin produced dry sockets in dogs by artificially infecing the extraction wounds and studying the tissue changes microscopically. Kronfeld[5] states the following: "From the viewpoint of the pathologist, a dry socket may be looked upon as a circumscribed osteitis of the alveolar bone with death of bone and formation of small sequestra. The immediate cause for the condition is the invasion of the socket by pathogenic microorganisms."

Fig. 1.—Undisturbed extraction wound, three weeks old, in man. Epithelization of the wound surface completed *A*, organization of the blood clot, the trace of which *B*, is still visible as a dark round mass. Deposition of fine new bone trabeculae *C* by the periosteum and endosteum. This layer of new bone is separated from the medial alveolar bone by periodontal membrane, *D*, which remained after extraction.

In the cases of dry sockets experimentally produced the wound in the jaw remains open and its floor contains more or less masses of foul-smelling material consisting of gangrenous granulation tissue and bone debris, while the epithelization on the surface is absent. Osteoclastic resorption involving the alveolar bone is greater than the deposition of new bone, so that new bone may be present in traces or entirely absent. Sometimes suppurative processes and areas of dead bone may be observed by microscopic examination.

The first histologic investigations of infected extraction wounds and their sequences in man were reported by me in 1930. The specimens were obtained by necropsy of two patients who died as a consequence of tooth extraction. Steinhardt[1] and Immenkamp[6] described similar cases later on and confirmed my findings and conclusions.

It must be emphasized that fortunately an overwhelming majority of infected teeth can be removed without the patient experiencing any ill effects. Nevertheless, even the minority of cases complicated by unexpected consequences stimulates our interest in this problem.

In order to understand the consequences and their extent which may follow extraction of teeth altered by acute or chronic disturbances, let us consider briefly the changes which are to be observed in the paradental tissues after the infection has extended beyond the apical foramen.

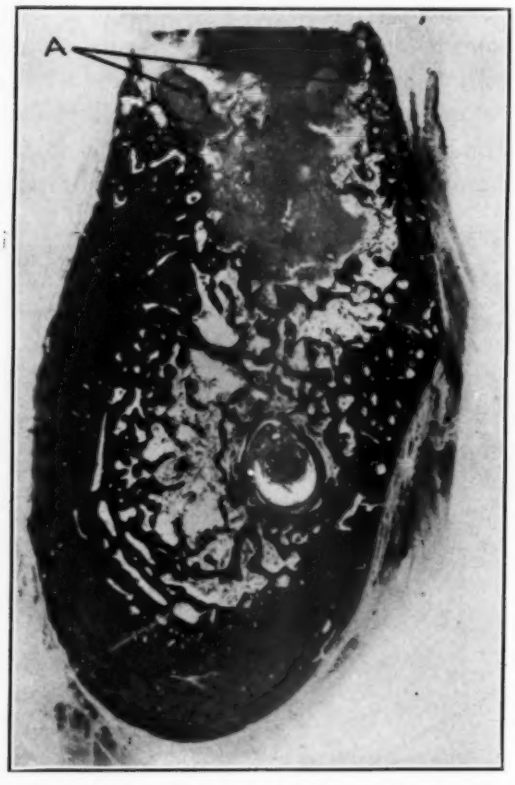

Fig. 2.—Disturbed extraction wound, twenty days old, in man. Buccolingual section through the mandible in the region of the medial socket of the first molar. Socket is very widened by resorption and filled with infected granulation tissue and pus. Two rounded tooth fragments, *A*, in the superior part.

It is unnecessary to go into the intricate details. Acute infective periapical inflammation is characterized by the development of a typical osteitis with predominating osteoclastic resorption of the surrounding bone due to the presence of a hyperemia with edema in the adjacent tissues. In the beginning of this alteration, which is clinically well defined, the surrounding bone marrow is involved rapidly and contains hyperemic blood vessels and masses of polymorphonuclear leucocytes and shows a widening of its spaces due to osteoclastic resorption of the bone trabeculae. If the organism is not able to defend itself successfully against infection caused by pathogenic microorganisms, suppuration occurs within the spongy bone, thus filling the bone marrow spaces with pus. It is beyond the scope of this paper to discuss the why's and wherefore's of this pus accumulation. But there can be no doubt that this process must be considered

as a localized osteitis or osteomyelitis from the standpoint of the pathologist, although clinical experience teaches us that such cases are usually benign.

This acute dentoalveolar abscess can be followed by a chronic osteitis and then by a granulation tissue produced as a defense of the organism against the further spread of the infection.

Two facts are of importance for our discussion: First, the infected gangrenous pulp is a continuous source of various microorganisms; second, the periapical region of chronically infected teeth harbors in the majority of cases streptococci and sometimes staphylococci. This is according to Stein.[7] I would like to add that the microorganisms mentioned can be found in the bone marrow spaces more or less isolated from the apical region.

A

Fig. 3.—Mediodistal section through a mandibular second molar in man showing the relationship of the chronic periapical infection to the mandibular canal *A*, the covering bone of which is resorbed;. infection involved the alveolar nerve.

The fact that a chronic periapical inflammation may become acute by an increase of the virulence of the bacteria or by other factors which prevent a further discharge of the exudate or which weaken the defense mechanism, plays an important role for our consideration.

The extraction of teeth so infected may propagate a spread of the infection as a result of the uncovering of bone marrow spaces and blood vessels.

The direction of the infective process in the jaws will depend particularly upon some anatomic considerations and their variations between the mandible and the maxilla plus their individual variability.

The limitations of this discussion do not permit me to explain in detail the different structural picture between the mandible and the maxilla. It must be sufficient to point out the distribution of the compact and cancellous bone areas, different in the mandible and the maxilla, the pneumatic structure of the maxilla due to the sinus and nasal cavity lined by a highly resistant epithelium, the different blood supply of the maxilla and the mandible, and finally, the most important fact, that the mandible is pierced by the mandibular canal. These considerations help to explain why the osteomyelitic processes occur more frequently in the mandible than in the maxilla. This opinion, which is generally accepted, is confirmed as a fact by my clinical experience. I found only three cases of osteomyelitis of the maxilla among seventeen cases of jaw osteomyelitis as a consequence of tooth extraction in the year of 1937.

The microscopic examination of two cases which expired due to osteomyelitis of the mandible after tooth extraction uncovered the importance of the mandibular canal in regard to the spread of infective processes. The minute anatomic relationships of the molars and premolars were studied by Job and Fouser;[8] they called special attention to the fact that the bony wall of the mandibular canal facing the tooth apices is extensively perforated, and that the canal is closely associated with the lingual plate and turns laterally to the mental foramen in the region of the premolars.

Fig. 4.—Mediodistal section through a mandibular first molar in man showing the relationship of an extended periapical abscess to the underlying alveolar nerve, *A*, which is infected.

Although the relationship of the molars and premolars to the inferior dental canal may vary individually, there can be no doubt according to my microscopic findings that the mandibular canal is an anatomic pathway for infection. Later investigators, Wassmund,[9] Immenkamp, and Steinhardt, further confirmed my conclusions.

The infection entering the mandibular canal involves the inferior alveolar nerve and causes a perineuritis and endoneuritis which may lead to a complete destruction of the nerve. We were able to prove these various pathologic stages of the infected inferior alveolar nerve using the classical staining method of Marchi for the demonstration of secondary degeneration of the myelin sheath following death of the axis cylinder.

Our investigations evidently showed regenerative changes of the nerves developed simultaneously with the degenerative ones, thus proving the great capability of the peripheral nerves to regenerate.

These findings enable us to explain the most remarkable symptoms of jaw osteomyelitis; it means the hyperesthesia of the lip and cheek first, followed by the hypoesthesia and the complete restoration of the sensitivity after healing. The patients suffering from osteomyelitis of the mandible complain mostly of an excessive sensitivity of the lip first, of a decreased sensitivity later on, and finally, a normal sensitivity, after healing.

Fig. 5.—Buccolingual section through the medial socket of a mandibular third molar of a man aged 31 years, who died of a mediastinitis on the third day after extraction. Socket enlarged by resorption is filled with suppurative granulation tissue which has spread into the mandibular canal, *A*.

Before I enter into a discussion of the practical significance of my microscopic findings for further symptoms and treatment of jaw osteomyelitis, I wish to explain the histologic changes in the jaws as obtained by necropsy from four individuals who died as a result of tooth extractions.

The microscopic pictures were different according to the clinical course of the diseases. There was one case of osteomyelitis of the mandible in a man, 31 years of ago, after extraction of the third molar which was followed by a sup-

purative inflammation of the mediastinum and death after the third day. The necropsy offered an opportunity to trace the suppurative process from the mandible along the sternocleidomastoid and sternohyoid muscles into the mediastinum. The mandible removed from the cadaver was examined microscopically, and the sections revealed an osteomyelitis limited to the region of the extracted molar.

The superior part of the medial socket was filled with a suppurative exudate which covered underlying granulation tissue and penetrated by a large opening into the mandibular canal. The bone bordering the socket was resorbed by osteoclasts which were demonstrable only in the areas of the granulation tissue, while in the region of the exudate the lacunar surface of the bone trabeculae was lined with pus. The bone marrow was replaced by suppurative granulation tissue. The contents of the mandibular canal involved by infected inflam-

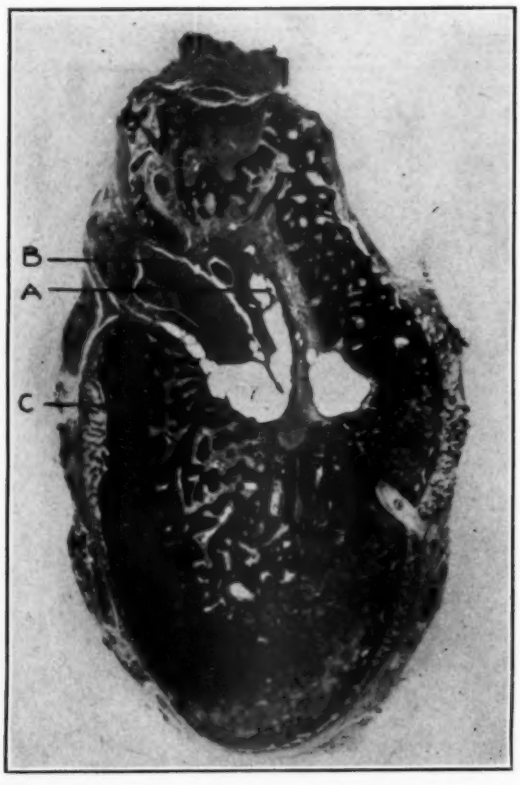

Fig. 6.—Buccolingual section through the distal socket of the case of Fig. 5. Suppurative exudate penetrates from the socket into a large resorption cavity, *A*, inclosing the mandibular canal and communicating with the lingual surface of the mandible by a large opening, *B*. Osteophytes, *C*, cover the jaw surface.

mation were separated by fluid of edema, while the bony wall of the canal was resorbed by osteoclasts. The blood vessels in the canal were hyperemic and the connective tissue sheath of the alveolar nerve (perineurium) was detached from the nerve by edema. Because of the brief duration of the disease, the nerve structure was unaffected. The sections through the distal socket demonstrated a different structure characterized by prevailing deposition of new bone, particularly on the outer surface of the jaw which was covered by a layer of osteophytes (Fig. 6). This socket was also filled with granulation tissue. The most

noticeable process produced by the rarefying osteitis was found on the lingual plate of the mandible. There was a wide perforation caused by the complete resorption of the bony wall separating the mandibular canal from the mouth floor so that the exudate lying in the destroyed spongy area communicated with the lingual surface of the mandible which was covered by an inflamed, thickened periosteum. This finding gives an anatomic explanation of the pathway of the suppuration spreading to the mediastinum within three days. The deposition of a large amount of new bone on the surface of the mandible, as well as inside the mandible, and the presence of granulation tissue prove that a chronic process had been developing for some time preceding the extraction. There was no doubt that the perforation on the labial surface of the jaw occurred previously because the surrounding bony wall showed many new bone trabeculae. The extraction of the molar was followed by an acute exacerbation of a localized chronic osteitis, and the spread of the suppuration took place through the perforation along the loose intermuscular tissues in the neck to the mediastinum where it became diffuse.

Fig. 7.—Mediodistal section through the region of the mandibular premolar in a man who died of septicemia following osteomyelitis of the mandible. Resorbing and rebuilding processes involving the whole bone. A large abscess cavity, *A*, incloses the mental foramen; osteophytes, *B*, on the lower border of the jaw.

In another case death was caused by septicemia twelve months after the extraction of the mandibular front teeth. This case of osteomyelitis eventually involved the entire mandible. The cadaver showed numerous incisions along the lower border of the edentulous mandible. The incisions led to the rough bone, the structure of which was shown by the x-ray to be particularly destroyed in the region of the left premolars. The roentgenogram of this side showed a

marked decrease of the osteitic changes toward the region of the second molar where the bone appeared to be intact while the mandibular canal was evidently enlarged.

The mandible taken from the cadaver was examined histologically. The sections through the body of the mandible on the left side above-mentioned revealed findings very important for the explanation of the spread of the infection. It is little wonder that all sections revealed, besides a rarefying osteomyelitis, also a condensing endostitis which attempted to replace the bone lost by osteoclastic resorption. This phenomenon found in chronic osteitis was more pronounced due to the extended duration of the disease. These rebuilding processes could be found particularly in and around the sockets of the lost teeth, while the destructive process was limited more to the mandibular canal. There was a very large roundish cavity below the region of the first premolar, bordered by bone trabeculae, covered by osteoclasts and filled in with granulation tissue and hemorrhages. The fact that sections of deeper regions showed the mandibular canal extending through this cavity made it more than likely

Fig. 8.—Mediodistal section through a deeper region of Fig. 7, showing the mandibular canal, *A*, running into the large cavity seen in Fig. 7.

to be the mental foramen. The connective tissue in the mandibular canal was changed by a dense cellular infiltration involving the alveolar nerve, the bundles of which were separated by edema. In some places the nerve was constricted by dilated vessels and edematous fluid. The progress of infection was demonstrated in sections through the molar region. While the osteomyelitic destruction of the bone evidently decreased toward the molars and finally disappeared so that the bone reached normal appearance, the infection progressed further along the mandibular canal.

A very extended inflammatory edema with hemorrhages advanced distally along this anatomic pathway involving and destroying its contents, while the surrounding bone was almost intact. The bone marrow spaces contained normal red marrow.

The two remaining cases expired of septicemia ten and twenty-two days after extraction of infected maxillary molars. The affected maxillae were removed at necropsy and examined microscopically. They showed a small amount of osteomyelitic process in the involved area in the one case, while the other showed an extensive destruction of the maxilla, including the left sinus which was completely filled with pus. The absence of any reconstructive process in both cases was remarkable.

Reviewing the microscopic findings, we must state their importance for an explanation of the diffusion as well as for the treatment of jaw osteomyelitis following tooth extraction. Due to the mandibular canal osteomyelitic processes have a better chance of spreading in the mandible than in the maxilla; however, because of the distribution of cancellous and compact bone, the resistance to osteomyelitic processes is greater in the mandible than it is in the maxilla. The large nasal and sinus cavities of the maxilla weaken the firmness of this bone against a destructive process, but the epithelium lining these cavities constitutes a fairly good barrier. If this barrier is overcome by the infection, a route for spreading is open. Since this outcome is infrequent, the diffuse osteomyelitis of the maxilla occurs seldom.

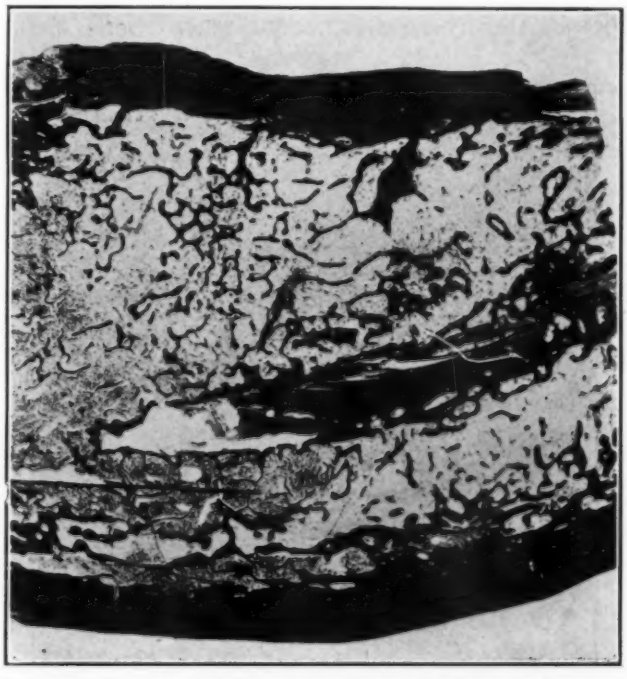

Fig. 9.—Mediodistal section through the molar region of the same case as Fig. 7. Infective process advancing through the mandibular canal, while the surrounding bone is intact and contains red marrow, *A*.

That the anatomic pathway of the mandibular canal favors the extension of the infection is proved not only by my histologic sections, but also by a clinical observation of a very infrequent case of a suppuration in the pterygomandibular space after extraction of the mandibular second molar. Within a few days after the extraction, an osteomyelitic process was developed in the socket, and the infection ascended along the mandibular canal to the mandibular foramen from which source the loose connective tissue between the

ramus and the internal pterygoid muscle was infected. The roentgenogram as well as the inspection of the ramus during the operation confirmed the fact that the infection took its course along the mandibular canal and not along the surrounding soft tissue.

The findings of extensive bone deposits in the involved area and especially around the sockets, in spite of a destroying process, must be considered as very important for the treatment. This rebuilding tendency must not be disturbed by treatment, but must be watched carefully. The care must be absolutely conservative. It is for this reason that the jaws must be immobilized. As the surgeon immobilizes a long bone affected by osteomyelitis, so the dentist has to splint the remaining teeth by the simplest method in cases of jaw osteomyelitis. To attain the best result the appliance should be extended to all teeth of the jaw. This immobilization will support the rebuilding of bone and will help to prevent a rapid extension of the process. Even extremely loose teeth must not be removed, but an effort to save them must be made. In the case of an edentulous jaw affected by osteomyelitis an extraoral bandage will prove sufficient.

Our histologic studies explain how slowly the demarcation of the dead bone develops and how patiently one must wait for its sequestration or its spontaneous elimination. At any rate the sequestrated bone, fully detached from

Fig. 10.

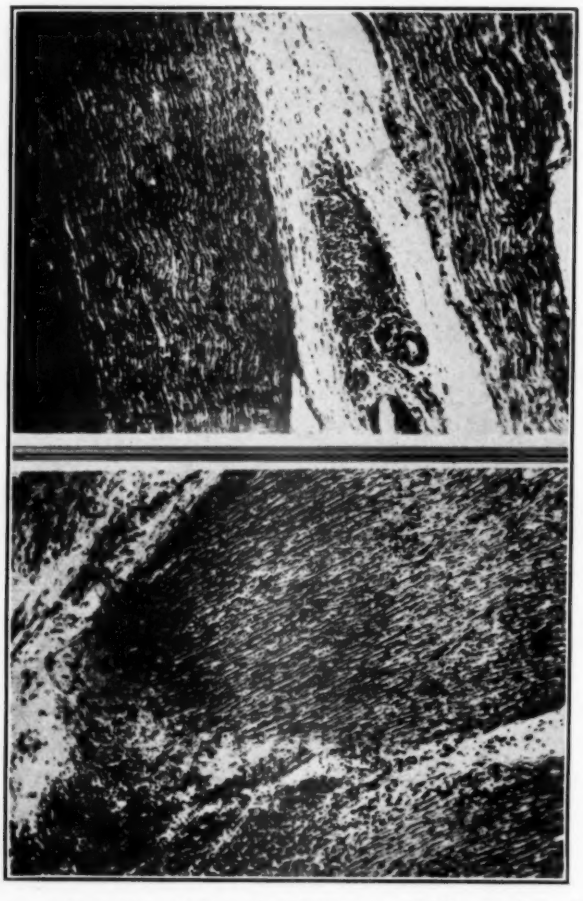

Fig. 11.

Figs. 10 and 11.—Dense infiltration of the alveolar nerve in the region of intact bone seen in Fig. 9.

the surrounding bone, controlled by roentgenograms taken at definite intervals, will be removed cautiously without any greater surgical interference.

This is done by an incision of the abscesses to establish sufficient drainage which must be maintained until the sequestrum is eliminated. This surgical treatment will become particularly important if the osteomyelitic process is accompanied by a cellulitis involving the mouth floor or neck. This condition was proved microscopically in our first case. Even though the osteomyelitic process ceases, the suppuration of the soft tissues may develop further so that the phlegmonous infiltration becomes independent of the osteomyelitic process.

This report dealing with the microscopic findings in jaw osteomyelitis proves the worth of Thomas Fillebrown's statement cited by Minor,[10] "The best treatment for osteitis is patience."

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TREATMENT AND COMPLICATIONS IN FRACTURES OF THE MAXILLARY BONES

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THE increase in the tempo of our daily lives has been responsible for the increased number of fractures of the facial bones in recent years. The treatment of the oral and maxillary injuries has fallen to the lot of the dentist in communities where there are no oral surgeons. The proper method of handling maxillary injuries is becoming more and more important to the dental profession.

Before launching into the main topic, may we say a few words on general consideration of fractures as a whole. There are six general types of fractures: greenstick, simple, compound, depressed, comminuted, and impacted. The etiology is nearly always, of course, trauma. The symptoms are those of inflammation plus abnormal mobility at the site of the fracture and crepitus, which is a grating sensation transmitted to the operator's hands by rubbing the fractured ends together.

The etiology of fractures may be divided into predisposing and exciting causes. The predisposing cause may be any bone disease, either general, such as rickets, or local, such as carcinoma, a sarcoma, or a cyst. The exciting cause of greatest occurrence is trauma.

Since November, 1932, the writer has cared for forty-four fractures of both the maxilla and the mandible. Twenty-three were caused by auto accidents, nine each by falls and fist fights, and the remaining three by an accident in a baseball game, a labor accident, and by striking the mandible on a fire escape which protruded into the street.

The treatment of a fracture involves treatment of the fracture itself and the tissues. Treatment of the fracture includes extension, separating the fragments, approximation, restoring them to their proper relationship, and retention, fixation of the parts without mobility.

Fractures of the superior maxilla are not as common an occurrence as those of the mandible. Nine of the forty-four cases mentioned above were of the maxilla. Two of these cases also suffered fractures of the mandible. Five of the fractures were simple, and four were compound.

The displacement of the fragments in the fractures of the maxilla is usually in direct line of the trauma. In diagnosing a fracture of either the superior or inferior maxillary bones there are eight factors to be taken into consideration. They are:

1. Number of fractures.
2. Location of fracture or fractures.
3. Type of fracture.
4. Extent of injury to tissues.
5. Nature of the deformity.

   (Under this subdivision it is of utmost importance to notice the disturbance or displacement of occlusion.)

6. Number of teeth present.
7. Oral health.
8. General health.

A fracture involving the alveolar process or just the maxillary bones is rather easily diagnosed. In fractures where contusion, laceration, and edema obscure the injury, the roentgenogram is the best means of diagnosis. The writer routinely has used anteroposterior and lateral jaw films in suspected fractures, supplementing these with a bite film of the hard palate in suspected fractures of the superior maxilla.

The treatment of a fracture may be divided as mentioned above into treatment of the tissues and the mechanical treatment. A case treated by the writer is one in which treatment of the tissues was of primary importance. A man 41 years of age was brought to St. Luke's Hospital, Newburgh, after an automobile collision. He was bleeding considerably from the mouth. When the writer examined him several days later, he found a nearly edentulous mouth with the exception of a left molar. This tooth was driven upward, not into the antrum; an intraoral opening into the sinus was found. X-ray examination revealed a fracture of the hard palate on the left side. Under local anesthesia the molar and all pieces of process which had been fractured were removed. These were quite large, and a bad odor was present from the wound. There was too much infection to suture, so we were obliged to allow healing to take place by first intention.

Another case treated at St. Luke's Hospital involved treatment of tissues which complicated the mechanical treatment. The patient had been brought to the hospital following an auto collision. He was a white man 55 years of age. The maxillary right central and lateral incisors had been knocked out, and there was a puncture wound of the soft palate just posterior to the junction of the hard and soft palates and to the left of the median line. The x-ray examination revealed a comminuted fracture of the superior maxilla starting at the alveolar margin at the median line and extending backward on the right side. The fracture was reduced by intermaxillary wiring. Two German silver arch wires were approximated to the buccal surfaces of the maxilla and mandible. The wound in the soft palate was found to be draining and an iodoform gauze wick that had been dipped in mercurochrome was placed in it. The maxillae were occluded by elastic bands. The drain was changed daily for four days. All drainage had stopped, the drain was removed, and the mandible was immobilized by intermaxillary wires. At the end of three weeks the patient wished to return home to New York. He was instructed to report to the oral surgery clinic at New York Post-Graduate Hospital for further treatment. The intermaxillary wires were changed to allow an examination of the wound in the soft palate. It had entirely healed.

The mechanical treatment of any maxillary fracture is primarily the restoration of occlusion. The selection of the appliance should be done, keeping the following considerations in mind. It should be: efficient, expedient, adaptable, and convenient. With the exception of the above edentulous case, the writer has used intermaxillary wiring in all of the cases of superior

maxillary fractures. The modified Kingsley splints were used in conjunction with intermaxillary wiring on a case brought in to St. Luke's Hospital following a head-on automobile collision on a holiday. The patient, a white woman aged 41 years, was brought to the emergency room bleeding profusely from the mouth and nose. Both eyes were badly bruised and swollen nearly shut. Clinical examination revealed a fracture of the whole superior maxilla. It was movable as a whole and displaced backward and downward, lying nearly in the throat. The patient was becoming embarrassed for breath. There was a compound fracture of the hard palate on the left side, displacing the left posterior teeth mesially. The attending surgeon was anxious to put the patient at rest to counteract the possibility of shock or skull injuries. As soon as the bleeding was controlled, a modified Kingsley splint (with a tray), which is used by Dr. Ivy, was filled with softened modeling compound and placed in the mouth. This was attached to the skull by bandages. Only enough traction was exerted to pull the maxilla forward enough to give the patient breathing space. The x-ray report showed a comminuted fracture of the right zygomatic bone and of the maxilla close to the right zygomatic bone; fracture involved the orbital process of the right maxilla; multiple fragments did not appear to show any depression and were apparently in good position. There was an oblique linear fracture of the left zygomatic bone and left maxilla, slight separation at the site of fracture. There was a linear fracture of the right and left maxilla in the region of the junction between the alveolar and palatal process of the right and left maxilla. The fracture was in good position.

Four days later the attending surgeon was satisfied that there were no symptoms of brain injury and felt it was safe to proceed with the oral surgery. The splint was removed and replaced by a similar modification of the Kingsley splint. A sketch of it is shown in Fig. 3. The arch bars were attached to the buccal surfaces of the maxillary teeth by means of brass ligature wires. A plaster head cap was used with (coat hanger) wires placed horizontally in the plaster. Traction was exerted forward and upward by means of straps attached to these wires and the splint as in Figs. 1 and 2. These straps were tightened gradually for eighteen days, when it was found that there was union enough to permit intermaxillary wiring. There was quite an open-bite and for the remaining four days that the patient was under my care the bite was gradually closed by tightening the intermaxillary wires. The patient was able to return to her home twenty-two days after admission. The bite was still slightly open and there was still some displacement mesially of the left posterior teeth.

The rich vascular supply of the maxilla is a big factor in a favorable prognosis of union. Where complications do not arise, union takes place much faster in the maxilla than in the mandible. In short, prognosis depends entirely on the presence or absence of complications.

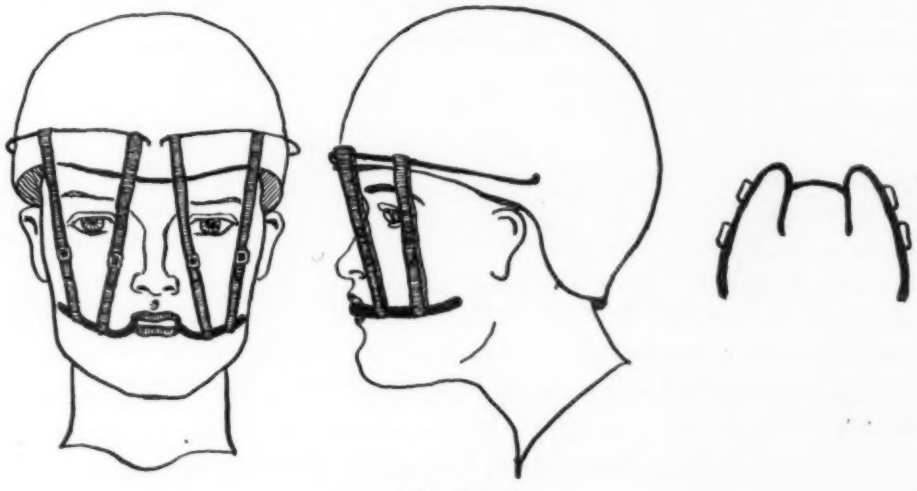
Fractures of the mandible occur in much greater proportion than those in the maxilla.

In the same period that the writer treated seven maxillary fractures he also treated thirty-seven mandibular fractures. The fracture may occur any

place in the bone, but it is most common in the mental region. There may be a single fracture or two or more fractures. The location and number of fractures cared for by the writer are shown in the following table:

Single	23	
Double	8	
Triple	6	
Single fractures; location,		
Symphysis		2
Angle		6
Mental region		7
Condyle		5
Molar region		3
Double fractures; location,		
Angle and mental		2
Mental and condyle		2
Symphysis and angle		1
Mental and molar regions		3
Triple fractures; location,		
Symphysis and rami		1
Symphysis and condyle		3
Symphysis, mental, condyle		2

The fractures of the mandible are the same as the four types occurring in the maxilla. A simple fracture usually occurs in the region of the ramus. The ramus is well covered with tissues and for that reason the mucous membrane is not torn. The ramus is covered on the buccal side by the masseter muscle, the masseteric fascia, and the skin. On the palatal surface it is covered with the internal pterygoid muscle, the pharyngeal and palatine muscles, and the mucous membrane.



Figs. 1 to 3.

A compound fracture of the mandible usually occurs at either the angle or in the body. The mucoperiosteum is easily ruptured at these points.

The displacement is primarily due to the force of violence, but it is modified greatly by the action of the muscles attached to the mandible.

A fracture in the region extending from the angle to the symphysis is greatly modified by the action of the mylohyoid, the geniohyoglossus, the digastric, and geniohyoid muscles all of which are attached to the hyoid

bone. In a fracture between the symphysis and the angle, the posterior fragment will be drawn inward and downward by the action of the mylohyoid.

In a double fracture in the mental region the anterior fragment will be drawn backward and downward by the action of the geniohyoglossus, the digastric, and the geniohyoid muscles. In a fracture at the angle the body of the mandible will be drawn downward and backward.

The muscles of mastication are attached to the ramus of the mandible. The action of the masseter, the temporal, and the internal pterygoid muscles serves in the closing of the mouth. The masseter is the most powerful of these muscles and may cause an upward tilting of the posterior of the body of the mandible.

Symptoms of a fractured mandible are the same as those of a fractured maxilla. Upon inspection of a fractured mandible if no displacement can be detected, any malocclusion should be carefully diagnosed; the writer is particular as to the routine of the three x-ray views. Without any one of these it is very easy to overlook a fracture that shows no clinical symptoms.

The treatment of the tissues is a very important phase of the reduction of mandibular fractures. The highly infected field in the mouth leaves compound fractures quite open to secondary infection and suppuration. In all compound fractures it has been the policy to extend the wound, either intraorally or extraorally, and to insert an iodoform gauze drain down to the site of the fracture. This was done routinely whether suppuration had started or not. This drain was changed daily and the wound irrigated with normal saline until all symptoms of infection had passed. Early consultation helps the oral surgeon in avoiding future infection. All recent articles on maxillary fractures plead with the general surgeons to call in early the oral surgeon or dentist. Attending surgeons in our hospitals would find it to their advantage and to the advantage of their services to have all oral injuries diagnosed and treated as soon as they find it possible.

In the mechanical treatment of fractures of the inferior maxilla the appliance selected must be one that will restore occlusion, counteract the displacement action of the muscles, and immobilize the mandible. All but two of the cases treated by the writer were treated by intermaxillary wiring. On one of these a modified Barton bandage was used, and the other will be described in a later paragraph. Intermaxillary wiring seems to be the most satisfactory treatment for the majority of fractures. The advantages of this method are:

1. It allows more accurate reduction by restoring correct occlusion and hence brings the fragments into their correct relationship.
2. It allows the operator full view of the relationship of the parts.
3. It is inexpensive.

In an edentulous mandible, fixation is done by means of circumferential wiring. A patient, a white man 71 years of age, was referred to our office on Dec. 22, 1934. He gave history of being attacked about 3 A.M. on that same day and first noticed his symptoms by being unable to eat breakfast.

He complained of swelling, movements of bone fragments of the mandible on the left side, and numbness of the lower left lip. Clinical examination revealed an edentulous mouth with a compound fracture (into the mouth) in the premolar region on the left side. X-ray examination (Fig. 4) revealed a fracture of the left premolar region extending diagonally back to the molar region; the distal fragment was elevated. On Dec. 23 under local anesthesia two incisions were made, one mesial and one distal to the fracture. The incisions were along the lower border of the mandible and at right angles to it. A trocar and cannula were passed up through the distal incision until they pierced the floor of the mouth on the lingual surface of the mandible. The trocar was then removed, a twenty-four gauge brass wire was threaded up through the cannula. The cannula was removed leaving the wire in situ. The trocar and cannula were then inserted in an incision in the vestibule of the mouth and forced downward until they emerged through the skin incision. The other end of the wire was then inserted and passed up on the buccal side of the mandible. An identical procedure was carried out mesial to the fracture. A splint was then inserted in the mouth and both wires fastened on its upper surface. The skin incisions were closed by dermal sutures. The patient was discharged from the hospital on Dec. 25. On Jan. 21 the wires and splint were removed. The fracture had united firmly.

Fig. 4.

Fractures occurring in the ramus may have the fragments displaced by action of the muscles. A patient, a male aged 39 years, was admitted to St. Luke's Hospital after being struck about the head, apparently while intoxicated. A clinical examination revealed swelling about the left side of the mandible, an edentulous maxilla, and a mandible with some anterior teeth that were badly decayed. X-ray examination revealed a fracture of the ramus of the mandible. The anterior fragment was displaced mesially. The patient was given a mandibular injection of novocain on the left side. The mandibular left molar, the only tooth remaining in the posterior region of the mouth, was removed. It was loose and seemed to be potentially guilty of being a cause of future infection. A plaster head cap (Fig. 5) was placed on the skull with a heavy (coat hanger) wire attached to it. This wire ex-

tended from the head cap vertically downward on the left side to about the angle of the mandible. An arch wire was approximated to the remaining anterior teeth. Traction was exerted by a brass wire running from the heavy wire to the arch wire. A rubber catheter tube was placed over the brass wire to prevent it from irritating the lip. In five weeks the head cap and arch wire were removed. There seemed to be good union of the fragments.

A fracture at the symphysis with a loss of bone and teeth may occur. On the night of April 28, 1935, a woman 40 years of age was admitted to St. Luke's Hospital suffering a pain in her mandible, bleeding from severe lacerations on her chin and forehead, and abrasions of the face. A clinical examination showed a fracture of the mandible involving the four mandibular incisors. The incisors had been pushed back in the floor of the mouth under the tongue. X-ray examination on April 29 revealed a fractured condyle on the right side. It was in good position. Anterior teeth at the symphysis were pushed backward. There was a fracture distal to the right first premolar. The fragments were in good position. On April 29 in the operating room the mandible was partially immobilized under local anesthesia. Traction was applied to fracture at the symphysis in an attempt to separate the sides of the fracture to allow the four incisor teeth to fit back into the normal alignment. This was done by a modification of the method of Scheehorn.

Fig. 5.

Two German silver arch wires were fixed to the sides of the fractured symphysis. Each arch wire was allowed to overlap the other. Their ends were bent to form hooks. Elastic bands were slipped around each hook. An incision was made to communicate with two deep lacerations on the chin. An iodoform gauze drain, one-fourth of an inch wide, was inserted in each of these lacerations. They had begun to suppurate. An arch wire was affixed to the maxillary teeth. On May 6 the depressed fragment was placed in proper position. The mandible was entirely immobilized by intermaxillary wiring. On May 8 the patient was discharged from the hospital. The drainage from the wounds had stopped. On June 20 the intermaxillary wires were removed. There was good union of the anterior fragment. On June 27

the arch wires were removed. There was good motion of the mandible. On July 11 the patient was discharged. Temporomandibular motion was normal.

In the treatment of fractured condyles the writer has used intermaxillary wiring entirely. Fifteen cases have been cared for in this manner without any complications of the temporomandibular joint. A man, aged 39 years, was brought to St. Luke's Hospital on Dec. 10, 1935, following an automobile accident. Clinical examination revealed a one-inch laceration of the scalp, hematoma of the forehead, all of the maxillary teeth on the left side knocked out, and lacerations of the lips. X-ray examination showed a fracture of the styloid process of the right and left temporal bones, a transverse fracture in the median line, a transverse fracture of the necks of the condyles on both sides with displacement downward and inward (Figs. 6, 7, and 8). German silver arch wires were approximated to the maxillary and mandibular teeth, and gradual traction was exerted by means of Winter's arches. These were replaced by intermaxillary wires in three days. On Dec. 20 the patient was

Fig. 6.

discharged from the hospital. On Jan. 18 the intermaxillary wires were removed. There was limited motion of the temporomandibular joint. On Jan. 21 there was much more normal motion. Good union had occurred at the site of the fracture in the median line. On Jan. 28 there was normal motion.

Ten of the fractures treated by the writer became suppurative, one of these going on to osteomyelitis. Dr. Gilmer reports that there is abscess formation in 60 per cent to 65 per cent of cases of fractured mandibles. He feels that they are caused by:

a. Organisms from the buccal cavity.
b. Fragments of necrosed bone.
c. Fragments of teeth.

The writer instructed the house men at the hospital to use drains in cases of facial wounds where they feel that there is a possibility of a fractured mandible. So often cases have been encountered where wounds are draining through the suture line or else the suture line is stopping the wound from draining, with consequent necrosis of tissues and swelling. It has also proved beneficial in fractures compounded into the mouth to make an incision early down to the site of the fracture and leave drains in the incision until infection has been avoided and stops. The above-mentioned case which resulted in osteomyelitis was treated for sixteen weeks before the patient was discharged. The patient was admitted to St. Luke's Hospital on July 21, 1937, after his car had skidded and overturned. The writer was asked to see the patient on July 24,

Fig. 7.

and he found lacerations in the left submaxillary regions. The lacerations had been sutured. The attending surgeon requested palliative treatment for a few days as he feared possible skull fracture. X-ray examination on July 23 revealed a transverse fracture on the left side of the mandible in the region of the

first molar, considerable displacement, transverse fracture on the right side in the region of the canine and first premolar teeth with very little displacement. Blood counts were as follows:

	WHITE BLOOD CELLS	HEMOGLOBIN	POLYS	LYMPHOCYTES	EOSINOPHILES
July 22	7,800	90 per cent	82	18	-
July 26	9,600	85 per cent	60	36	4

The left submaxillary region was found to have some oozing pus from the suture line and considerable swelling. The sutures were removed in this region and the tissues found to be quite necrotic. They were broken down to the site of the fracture. An iodoform gauze drain was inserted in the wound. This drain was changed daily and the wound irrigated with normal saline. The fracture was reduced by intermaxillary wiring. An incision was made in the vestibule of the mouth opposite the site of the fracture in the right premolar region. An iodoform gauze drain was inserted. On Aug. 10 there was considerable fluctuation in the right mental region, and it was found necessary to

Fig. 8.

make an extraoral incision for drainage. Considerable pus was found. The blood count on Aug 10 was, white blood cells, 13,650, hemoglobin, 90 per cent, polys, 69, and lymphocytes, 31. The patient also suffered a fractured hip and was not discharged from the hospital until Aug. 24. Drains were changed

and wounds irrigated daily in the office in the same routine as had been carried on in the hospital. On Sept. 2 a piece of sequestrum was removed in the mouth from the right mental region and on Sept. 3 another sequestrum was removed from the same area extraorally. This wound then stopped draining and commenced to heal. Several large sequestra were removed (Fig. 9) from the region of the left angle on Sept. 4, 8, and 9. The last piece contained what was thought to be a portion of the mandibular canal. On Oct. 21 there was considerable fluctuation present, inferior to the wound on the left side. This was opened extraorally and considerable pus was found. On Nov. 10 a large sequestrum was removed from this incision. The next day there was little or no

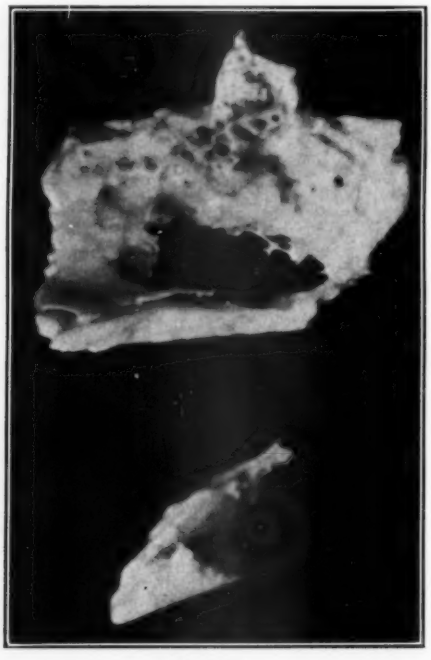


Fig. 9.

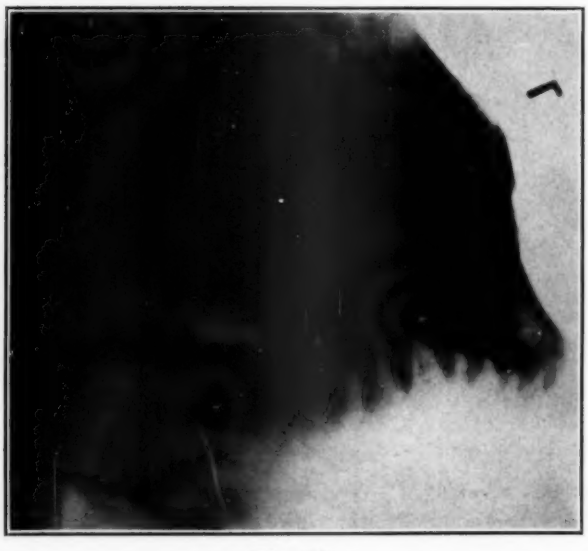


Fig. 10.

drainage. On Nov. 15 the patient was discharged; the fractures had united firmly, and drainage had stopped.

CONCLUSION

The plea for early consultation has been thoroughly sounded in a previous paragraph. The old axiom, "An ounce of prevention," etc., never was truer. The potentiality of infection would seem to be in direct proportion to the early reduction of the fracture and treatment of the tissues. In cases in which the attending surgeon did not deem it wise to reduce the fracture immediately, the writer inserted drains in the wounds that either communicated extraorally or intraorally. In lacerations that required suturing as an emergency treatment, it has been found successful to use sutures in combination with a rubber drain. Cases that do become infected should be drained until sequestration occurs.

Complete preoperative and postoperative x-ray examinations are the most important points in regard to diagnosis. In addition to the routine anteroposterior and lateral views, bite films are also important in diagnosing the displacement in mandibular fractures, as they show a different plane than the larger extraoral films. Complete x-ray and vitality test examination should be done after the intermaxillary wires have been removed. Teeth that have previously had root canal work or teeth that have been devitalized, incidental to the trauma that caused the fracture, may be the site of future infection. The writer treated a case that drained for six months from the site of the fracture at the symphysis. All the teeth in that area were x-rayed negative until the sixth month. The left central and lateral incisors were found to have considerable necrosis at their apices. These were removed with some sequestra; a fistulous tract was found that communicated from the sockets of these teeth with a wound on the chin. All drainage had stopped within a week after the extractions.

The last, but not the least, salient point is that all fractures, no matter how simple and with how little displacement, should be reduced and immobilized. This point was brought home by a case which, in fact, was most simple, but it perplexed us at St. Luke's for nearly a week. The patient, a white woman 23 years of age, was brought to the hospital after an automobile collision on Oct. 23, 1934. She complained that she was unable to open her mouth widely and had considerable pain and swelling on the left side. Clinical examination revealed nothing other than the swelling and trismus. X-ray examination (Fig. 10—the x-ray has been retouched by the photographer for emphasis) revealed nothing. There was an impacted third molar on the left side. There was a suspicious line running from the apices of the third molar down to the inferior border of the mandible. Another lateral view of the left side was ordered, and the same line was found again. The roentgenologist did not feel that it was a fracture. The patient was using cold compresses and warm saline mouth wash, but the symptoms were not relieved. On Oct. 30 it was decided to immobilize the mandible. This was done by intermaxillary wiring. The following morning the swelling was greatly reduced and had disappeared entirely within forty-eight hours. The patient then made an uneventful recovery. It was decided that the diagnosis was a simple "fissure" fracture.

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CONGENITAL ABSENCE OF THE RAMUS OF THE MANDIBLE

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CONGENITAL absence of the ramus of the lower jaw is rare. Modern textbooks on the surgery of the jaw ignore it entirely, and only a few isolated cases are to be found in the medical and dental periodicals. Considerable difficulty is encountered when one endeavors to review the literature, as the reported cases are described either under different titles, such as agenesia of the mandible, hypo-agnathus, and congenital dislocation, or in association with teratological subjects. For a true perspective of this particular congenital defect Ballantyne's review and discussion of mandibular anomalies is indispensable.

When absence of the ramus is bilateral, concomitant defects and malformations make the victim a notable monstrosity. One subvariety of cyclops' monster also presents a complete absence of the entire lower jaw. The main object of this paper is to report five cases of congenital unilateral absence of the ramus, and to outline tentative methods of treatment.

REVIEW OF THE LITERATURE

In addition to the five cases reported in this paper, nineteen cases have been found in the literature. The earliest case was described in 1827 by Dugès, the defect being on the left side. In 1861, Canton presented the case of a girl, aged sixteen, who died at Charing Cross Hospital, and on post-mortem examination an absence of the ascending ramus on the left side, with associated microtia, was discovered. Tomes in 1872 described a specimen of the jaw bone in which the development of the left ramus had been arrested. The horizontal ramus was no longer than that of a child of two years, although the other side of the jaw was fully developed. The author thought that some abnormality in the vascular supply might have brought about this condition, but he insisted on one point: the actual manner in which the growth had been arrested was the cessation of ossification in the articular cartilage.

In 1874, Alexander Ogston published in the *Glasgow Medical Journal* a series of articles on congenital malformations of the lower jaw, in which, in addition to two of his own cases, he reported an extensive description of a post-mortem examination in a case studied by R. W. Smith in 1847. The author called the condition congenital dislocation of the mandible, but the description and illustrations fit into the category of congenital absence of the ramus of the mandible. Kirmisson described a case in which, because of malformations of the mouth, the child could not nurse well. The infant died from asphyxia at the age of two and one-half months. The right side of the face was less developed than the left, and, by palpation of the two sides of the

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From the Plastic Clinic of the Massachusetts Eye and Ear Infirmary and of the Massachusetts General Hospital.

face, it was discovered that the ascending ramus of the lower jaw was missing on the right side. The ear was also deformed. Bürger, Davis, and, more recently, Rocher and Fischer have described other cases.

The cases reported in the past, as well as those in this paper, show that unilateral absence of the mandible may be accompanied by defects of the external ear, macrostomia, and other cranial deformities. In less serious cases of mandibular deformities, such as hypoplasia of the jaw without bone defect, cleft palate has also been reported (Eley and Farber). This entire group of congenital deformities, from an ontogenic point of view, is the result of imperfect development or rearrangement of tissues in the first branchial arch and cleft. Defects in the first branchial arch are said to be found in lower animals such as the lamb, which is born at times with absence of the entire lower jaw (Ballantyne). In the literature on the subject, however, the matter of treatment has been entirely neglected. In the following report of five cases an outline of treatment will be given.

CASE REPORTS

CASE 1.—F. T., a boy, was four years old when referred to the Massachusetts Eye and Ear Infirmary for treatment (Fig. 1). He was, however, first presented by Dr. Berry and Dr. Goodspeed at a meeting of the New England Otolaryngological Society in 1934, and he had been observed by these physicians practically from birth.*

"The patient came from a poor Italian family. He had two older brothers —one six and one five years old—and a younger sister, aged two and one-half. There had been no deaths in the family, no miscarriages, and no stillbirths. There was no family history of any congenital deformity. The mother's blood Wassermann was negative. During the fourth month of pregnancy, the mother had fallen down a flight of stairs and, although confined to bed for a few days because of general bruises, she appeared to have suffered no other injury. The patient was born at full term in the home and weighed six pounds and eight ounces at birth. No history could be obtained as to the presence of infarcts or deformity of the placenta.

"When four months old, the baby was placed in the hospital because of malnutrition. At this point his weight was the same as at birth. Although the parents said that he had trouble in swallowing, no difficulty was found after he had been taken from the breast and put on bottle feeding. During this stay in the hospital, his general condition was studied by competent pediatricians and no disturbance other than the deformity of the head and malnutrition could be found. The latter apparently was improved by a suitable formula, for, at the age of one year, he weighed fourteen pounds and fourteen ounces.

"The right ear consisted only of a narrow piece of buried cartilage, one and one-half inches long and five-eighths of an inch wide, which protruded about one-fourth of an inch above the surface of the head. There was a small tragus, and posterior to this there was a small dimple, which appeared to be

*Personal communication.

the external auditory canal and admitted a blunt probe for three-eighths of an inch. The normal ear was about two inches high and one inch wide. When the right mandible was palpated, the body could be followed backward to where one would expect the angle of the jaw to be, but no ascending ramus could be felt beyond this point. When the baby cried, the chin deviated to the right of the midline. There was no deformity on the left side, and no cleft palate or deformity of the nose was present. When the baby was seen at four months of age, no other abnormality was noticed about the face, but at one year of age the right upper jaw seemed to be smaller than the left. Roentgenograms of the skull, taken when the baby was four months old, did not show development of the mastoid cells or petrous portion as clearly on the right side as on the left. It was felt that a middle ear was present, although the semicircular canals did not show clearly in the roentgenograms. When the baby was one year old, gas-oxygen anesthesia was given on two occasions to obtain pictures of the jaws. On the left side there could be seen the calcification center for the first and second permanent molars, which is early for this age. The roentgenograms also showed clearly the absence of the condyle and the ascending ramus of the right jaw."

Fig. 1, Case 1.—F. T., at the age of four, showing hypoplasia of the right side of the face.

This patient, now aged six, is at the present time under treatment at the Massachusetts Eye, and Ear Infirmary for the reconstruction of the ear. No attempt has yet been made to repair the defect of the mandible. He is a healthy, good-natured child, and, aside from the distortion of the lower jaw and microtia, no other physical deformity is apparent. The permanent teeth are beginning to erupt in the regular time, but the occlusion is completely distorted.

Case 2.—L. B., female, aged ten years, was examined on June 3, 1935 (Figs. 2*A* and *B*). She had congenital absence of the right ramus with marked asymmetry of the face. Most of the permanent teeth had erupted. The hearing was apparently absent on the right side, and the auricular canal was narrow on inspection. The bones of the face on the right side seemed smaller. The patient's left shoulder blade and the left foot seemed larger than their opposites.

The child limped slightly because of the discrepancy in the size of the feet, according to the child's mother.

The roentgenographic report by Dr. A. S. MacMillan was as follows: "The ramus of the right jaw is not developed. There is not enough bone behind the second molar (which is well developed) to accommodate the lower right third molar. The glenoid cavity is undeveloped. The middle ear and the external and internal canals are apparently normal. The mastoid development on this side is rudimentary. The zygomatic arch is complete, but rather small. The malar bone and superior maxilla on the right side are smaller than on the left side. The scapulae on both sides are normal. The ribs on the right side are slightly higher than those on the left, and there is a greater space between the third and fourth ribs on the right side than on the left. The clavicles and the upper ends of the humeri are normal."

In this case it was decided that orthodontic treatment should be instituted as the first step. An attempt to expand the upper arch and to advance the mandible on the right side by appliances is at present being carried out by the child's orthodontist. The patient has not been seen again since her first visit.

Fig. 2*A* and *B*, Case 2.—L. B., on June 3, 1935, at the age of ten, showing external deformity of the right side of the face.

Case 3.—D. P., male, aged eight, was first seen in 1931, when he was one year old. He was a well-developed child, with the exception of a conspicuous deformity of the right side of the face. There was complete absence of the right ear, and in its place there were a few tags of ear tissue in the center of the cheek with a definite depression of the mastoid, zygomatic, and temporomandibular regions. The child had a congenital fissure of the right corner of the mouth and this, combined with retrusion and deviation of the lower jaw to the right, caused a great distortion of the mouth (Figs. 3*A* and *B*).

The lower jaw was undeveloped, with complete absence of the right ramus and the zygomatic arch. The lower temporary teeth were beginning to erupt, but the occlusion of the teeth was very much disturbed, owing to the shifting of the mandible to the right. The left temporary cuspid tooth was opposite the

upper centrals. The patient's head looked rather large, but, according to his parents, the child had never been ill. The roentgenographic report was as follows: "Total absence of the right ascending ramus, from the region one-half inch posterior to the first molar. Absence of the glenoid cavity and of the middle ear. The mastoid cells are undeveloped and the zygomatic arch is absent" (Fig. 4).

Here again, the family history was entirely negative. At the present time the patient is eight years old. No attempt has been made as yet to correct the mandibular deformity. The reason for delay will be discussed later in this paper. However, the patient has been operated upon several times for correction of the macrostomia and the microtia.

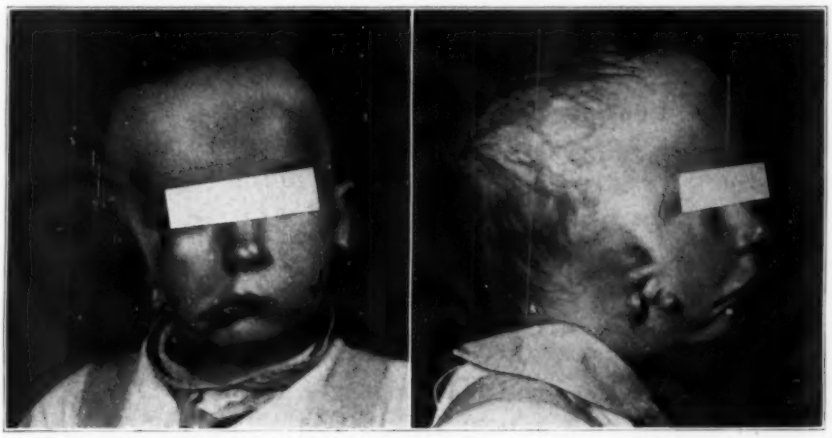


Fig. 3*A* and *B*, Case 3.—D. P., on May 4, 1933, at the age of three, showing agenesia of the right mandible and microtia.

Fig. 4, Case 3.—D. P. Roentgenogram showing absence of the right ascending ramus.

Case 4.—M. A. B., female, aged three, was examined on Nov. 1, 1935 (Figs. 5*A* and *B*). She was found to have marked asymmetry of the face due to lack of development of the left side. The left external ear was entirely missing, except for a small anteriorly misplaced tag. The mastoid tip was undeveloped,

and the zygomatic arch and glenoid cavity seemed to be absent. The neck of the condyle and the ascending ramus on the left side were missing. The horizontal ramus on the left side was short. There was no facial-muscle paralysis present. The roentgenographic report was as follows: "There is very marked asymmetrical development of the facial bones. The left petrous bone is incompletely developed. There are no mastoid cells and no roentgenographic evidence of a middle ear. The inner ear appears normally developed on both sides. There is asymmetrical development of the mandible, the left side being very incompletely developed. The glenoid fossa on the left side is undeveloped."

The author has not seen this child again and is unable to trace the case at this date.

The following case is the only one in which an attempt was made to reconstruct the mandible. The various procedures will be discussed in detail.

CASE 5.—D. M., male, was seen for the first time on June 8, 1933, at the age of seven years. The family history was negative. The parents, as well as a sister and a brother, were perfectly healthy and did not have any physical defects. As far as their ancestors could be traced, there was no evidence of a

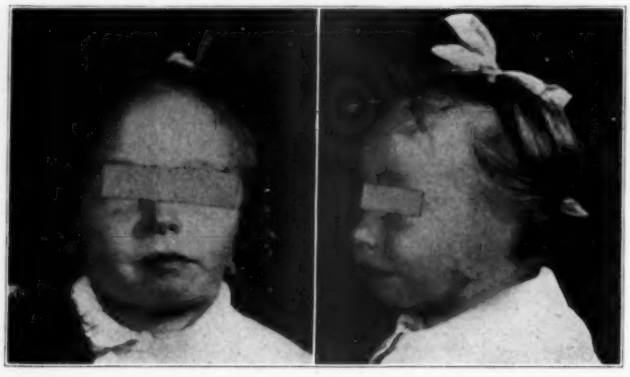
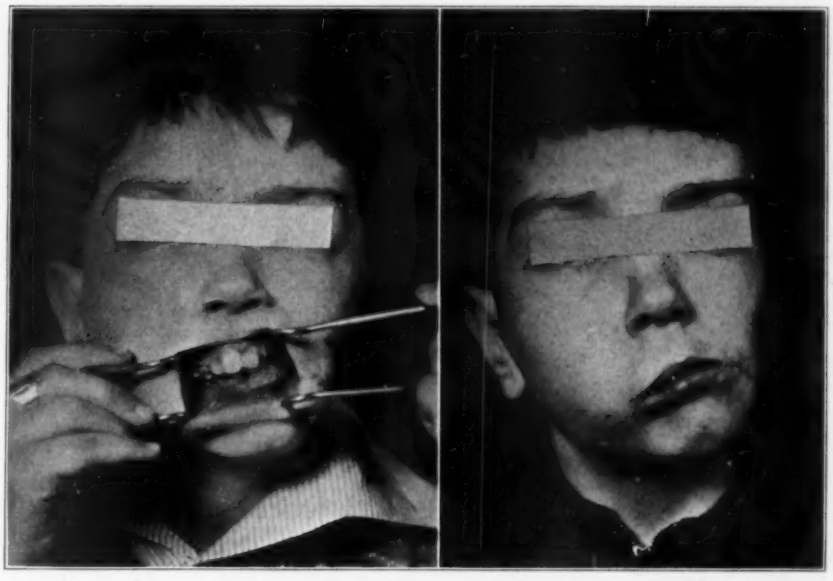


Fig. 5*A* and *B*, Case 4.—M. A. B., on Nov. 1, 1935, at the age of three, showing asymmetry of the face.

similar deformity. Examination showed a well-developed child, mentally alert, and quite sensitive regarding the appearance of his face. Physical examination was essentially negative. The examination of the face revealed the following conditions: The left side of the face was undeveloped, and the left ramus was totally absent. There was no evidence of temporal, masseter, or pterygoid muscles, and there was no auricular canal. The external ear was a mass of folded tissue. The occlusion of the teeth was badly distorted, and there was a pronounced deviation of the mandible to the left (Figs. 6*A* and *B*). There was a linear scar about one inch long, extending from the left corner of the mouth horizontally backward toward the cheek. The patient was born with a congenital fissure at this angle of the mouth.

The following is the report of the roentgenographic examination by Dr. A. S. MacMillan: "Congenital anomaly of left temporal bone and ramus of left jaw. The mastoid process, the external canal, the glenoid cavity, and the

zygomatic arch are absent. The squamous portion, the petrous pyramid—including the semicircular canals—the cochlea, and the internal auditory canal are normal. The mastoid cells, the antrum of the middle ear, and the contents of the middle ear are undeveloped. The first lower left molar is erupted. The crown of the second molar is formed, and there is enough space for the third molar, which is forming. The entire vertical ramus is missing. The left orbit is asymmetrical and slightly smaller than the right. The asymmetry involves the greater wing of the sphenoid on this side. The left malar bone and zygomatic process are smaller than the right'' (Fig. 7).



A. *B.*

Fig. 6*A*, Case 5.—D. M., on June 8, 1933, at the age of seven, showing the distorted position of the teeth and marked deviation of the mandible to the left.

Fig. 6*B*, Case 5.—D. M., showing the facial appearance previous to treatment.

Fig. 7, Case 5.—D. M. Roentgenogram on June 8, 1933.

The hearing test was as follows:

Right Ear		*Left Ear*
20/25	Whisper	0
20/35	Conversation	0
23000	Upper Limit	0
64	Lower Limit	0
30/15	Rinne's Test	0

After careful study it was decided to start the surgical repair of the ear at an early date. In the meantime it was considered advisable to refer the patient to a competent orthodontist in his home town to see if it would be possible to correct the irregularities of the teeth, and perhaps to prevent further distortion of the mandibular and maxillary arches, with recommendations to expand the upper arch and to use intermaxillary elastics on the left side in order to retain the mandible at the median line. The orthodontic treatment continued for almost a year, resulting in quite satisfactory development of the upper jaw, but it was evident that the mechanical methods were not effective in controlling the lower jaw, which seemed to swing constantly toward the left. It was then decided to resort to other methods in order to prevent at least further distortion of the teeth and jaws.

The surgical treatment of this case consisted in reconstruction of the vertical ramus of the jaw and of the ear. Although the repair of these parts was carried out simultaneously, we shall omit discussion of the surgical problems associated with reconstruction of the ear and devote our attention to the mandible.

SURGICAL TREATMENT OF THE MANDIBLE

There were two methods under consideration: (1) construction of special appliances other than for regulating the teeth; (2) transplantation of bone to reconstruct the missing ramus.

1. Dental appliances for the control of the lower jaw in patients who have undergone operations for the resection of the mandible have been used satisfactorily by dentists in the past, as well as by the author. They are intended to transfer the function of the temporomaxillary joint from the region of articular eminence to a place distal to the last upper teeth. This is to prevent a backward swing of the jaw on the defective side of the mandible. The difficulty in making such an appliance for this patient was due to the fact that his permanent teeth, which would serve as abutments, were not adequately erupted and could not be utilized for the retention of an appliance strong enough to serve for an indefinite period.

2. Transplantation of bone presented some obvious difficulties. In the first place the child had not acquired his full growth, and further changes in the facial contour would be constantly taking place. The right side of the face was growing normally, but the development of the left side was obviously delayed for an unknown reason. It was, therefore, questionable whether or not transplanted bone would keep pace with the rest of the facial bones.

The second difficulty was the uncertainty of being able to transplant bone when only one end of the transplant would be in contact with the mandible.

It is true that successful attempts to do this have been made in the past by Gillies and others in patients who had lost one-half of the mandible, but this patient did not possess a glenoid cavity. It was finally decided to reform the mandible by transplanting bone, and the following plan was adopted: A dental splint was made and adjusted to force the lower jaw to the extreme right. This splint consisted of gold bands on the following lower teeth: two incisors, right

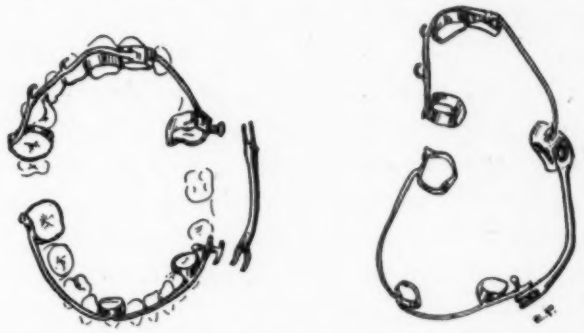


Fig. 8.—Retention splint to steady and to maintain the mandible in its new position.

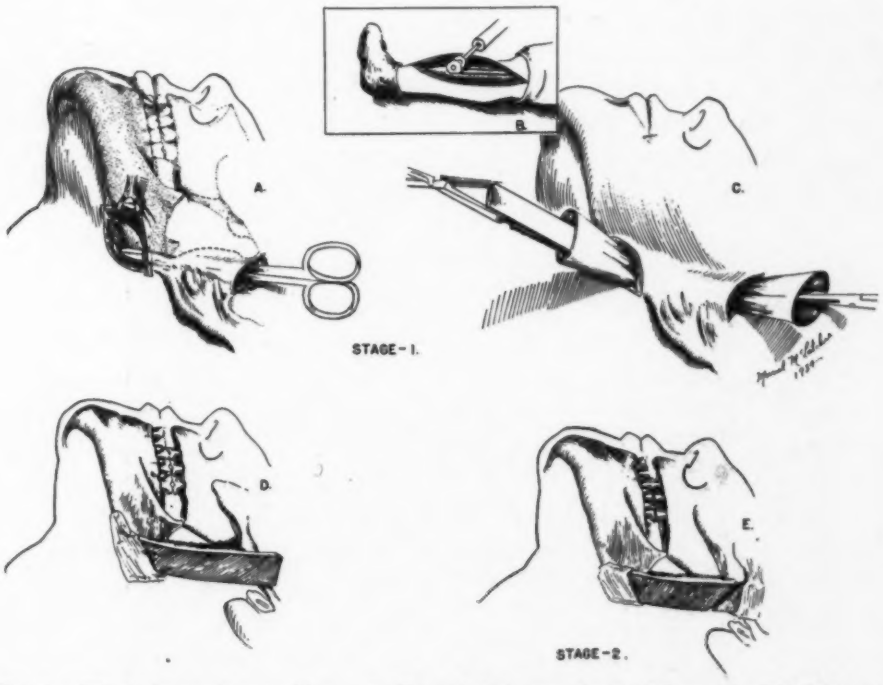


Fig. 9.—First stage of operation: *A*, Tunnel between the incisions; *B*, Tibial transplant; *C*, Transplant in position.

Second stage of operation: *D*, Transplant in contact with temporal bone above and mandible below; *E*, Section at upper end of transplant to create new joint.

and left temporary cuspids. These bands were cemented together with a No. 18 gold wire. A gold button was soldered to the buccal side of the left cuspid tooth. Another appliance of similar design was fastened to the upper jaw. In this appliance the upper left second molar was banded also, and another button was soldered to the buccal aspect of this appliance. The appliances were cemented over the upper and lower teeth before the operation, and, while the patient

was under anesthesia, the lower jaw was forced to the extreme right and held in that position by a stout gold wire with a fork of more flexible wire at each end. These forks fitted into the gold buttons above and below (Fig. 8). This appliance steadied the mandible and immobilized it in its new position, a fact which greatly facilitated the subsequent operation.

Our plan was to connect the transplanted bone to the temporal bone above and to the mandible below, and to create bony ankylosis, to be followed later by an arthroplasty. This plan worked quite successfully as will be seen.

At operation (Fig. 9), on Nov. 19, 1934, under avertin and ether anesthesia, an incision about one and one-fourth inches long was made below the border of the left mandible, near the angle of the jaw, and the buccal aspect of the jaw was exposed as far back as possible. Another incision about one inch long was made over the temporal area, and the temporal bone was exposed. With a blunt instrument, tunneling was done until communication was established between the upper and lower incisions. The bone surfaces were freshened by removing a thin shaving with chisel and rongeur. A piece of tibial bone—about four inches long, one-half an inch wide, and over one-quarter of an inch thick—was then removed from the upper anterior surface of the tibia. The transplant was passed through the entire length of the tunnel from the lower incision until it fitted firmly into the temporal bone above and the mandibular bone below. An osteoperiosteal graft was inserted along the lower border of the mandible as far back as possible. The incision wounds were sutured, and a pressure bandage was applied.

Fig. 10, Case 5.—D. M. Roentgenogram showing the transplant seven weeks after operation. Note bony union at each end. Also shows the splints in position.

When the patient had recovered sufficiently from the effects of the anesthesia, the upper and lower jaws were fastened together by twisting flexible wires around the dental splints. He made an uneventful recovery and was discharged from the hospital on Dec. 8, 1934.

From the date of the operation until after the second operation, the patient lived on a liquid diet. He gained in weight and did not seem to suffer any hardship from having the jaws wired together.

X-ray examination on Jan. 31, 1935, showed no absorption of the transplant. Moreover, bony union was complete at each end of the transplant (Fig. 10).

The second operation was performed under avertin-ether anesthesia on Feb. 2, 1935, seventy-five days after the first operation. An incision was made in front of the left ear, following the old scar line for about one-quarter of an inch. With a blunt instrument, the subcutaneous tissue was carefully separated, and the upper end of the bone transplant was exposed freely. After the bleeding had been controlled, a good-sized dental burr was used to cut through the transplant at about the level of fusion with the temporal bone. The cut was made diagonally downward and backward (Fig. 9*E*). In addition, the skin over the ramus was undermined quite freely. A strip of fascia lata and fat, about three inches by one inch in size, was removed from the left thigh. One piece about one inch square was wedged in the fissure just made by the burr, while the other piece, which was larger, was spread under the skin over the ramus in order to give greater fullness to the face. The wound was closed with silk, and a pressure bandage was applied.

Fig. 11*A* and *B*, Case 5.—D. M., after operation, showing improved occlusion of the teeth and facial contour. *A*, December 17, 1934, *B*, April 18, 1935.

The patient has been under constant observation. The operation was quite successful in several respects (Figs. 11*A* and *B*). There is marked improvement of the facial contour, although it must be stated that complete symmetry of the face has not been achieved; this was not expected, however, as the underdevelopment of the left side of the face was not wholly due to the absence of the ramus of the mandible. The patient has full control of the jaw, except that the newly formed joint has not the same gliding action as the normal joint.

DISCUSSION

Although the immediate effect of the operation is gratifying, it is too soon to make any predictions of the eventual outcome in regard to the development of the left side of the face, but one can see possibilities for further operations in the form of bone, cartilage, or fascia transplantations, in order to give better symmetry of the face.

While this case shows an encouraging result in supplying the missing mandibular section by the transplantation of bone, yet it does not seem to the author altogether satisfactory. First of all, there is definite lack of normal development of the existing part of the mandible on the affected side, and, as the child grows older, this will appear more and more marked. Second, early treatment by transplantation of bone by the method described is not practical in young children. As a result, the delay causes definite malocclusion of the teeth, which is particularly noticeable in the upper arch. Mechanical devices to control the normal movements of the mandible have their difficulties also, on account of the age of the patient and the gradual replacement of the temporary teeth with permanent ones.

Transplanted bone and arthroplasty give good functional results, but grafted bone is not expected to grow in size or to cause improvement of the facial contour.

However, from the experience gained in the treatment of unilateral deformities of the mandible of acquired origin, it may be stated that as soon as a child with such a deformity reaches the age of twelve or over, and when all the permanent teeth (except the third molars) have erupted, it is possible to do osteoplastic operations, combined with dental and orthodontic treatment, thus improving the general facial contour of the patient.

SUMMARY

Unilateral absence of the ramus of the mandible is a rare deformity. It represents a clear-cut defect, which has been described under a variety of titles, thus making it difficult to discover in the literature. It is very often associated with microtia (in four out of the five cases here presented) and at times with unilateral fissure of the mouth (in two of the present group of cases).

Embryologically, this defect is thought to be caused by improper development of the various elements of the first branchial arch and cleft. Other facial and cranial bone anomalies, however, are present rather often, especially in the temporal bone. The question may be raised whether these anomalies are not secondary to the absence of the mandibular segment, which thus deprives the surrounding tissues of a normal growth stimulus.

The five cases reported here have been collected over a period of the last eight years. Their treatment in general has been conservative, except in the case of the soft tissue defects. The repair of mouth fissures and the building up of the ear when absent has not been delayed. The treatment of the mandibular defect is best postponed until the permanent teeth have erupted to permit the use of proper splinting and for other considerations outlined in the last case. Orthodontic measures, however, should be instituted early.

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Case Reports

A case report of an unusual cyst and its treatment has been sent in by Dr. Morton F. Yates of the Harvard Dental School, Boston, Mass. This case shows many interesting angles. First of all we have a cyst which has healed without surgical operation. This can be explained on the basis that an acute suppurative process had destroyed the epithelium lined cyst sac allowing granulation tissue to form after the infection had subsided. The case is also of interest because it shows the effect of pressure of the cyst against the roots of the teeth and tendencies towards attaining normal position when the pressure was eliminated.

All contributions to this department should be sent to Dr. Kurt H. Thoma, 53 Bay State Road, Boston, Mass.

CASE REPORT NO. 35

MANDIBULAR CYST WITH INFECTIONS

MORTON F. YATES, D.M.D., BOSTON, MASS.

MISS LYDIA B., a young woman 24 years old, was in excellent health. Her mouth was in very good condition.

Local Examination.—Examination showed slight discoloration of the right mandibular first incisor. It had never given her any discomfort. The tooth gave no response to the pulp test, but all the other teeth reacted normally.

Roentgen Examination.—A roentgenogram was taken which showed what appeared to be a rather large cystic area in the median line of the mandible, involving the right mandibular first incisor as shown in Fig. 1. Although the mesial incisal angles were in contact, the roots of both the mandibular incisors appeared to be pushed apart due to the pressure exerted by the cyst.

Treatment.—After taking a complete oral and physical history, the tooth was opened under aseptic conditions and a gangrenous pulp was found. The pulp canal was flushed with Dakin's solution after which a formo-cresol dressing was sealed into the tooth with cement. When the patient returned, she suffered from exacerbation, presenting the symptoms of acute inflammation. The tooth was opened for drainage to let the acute phase of the infection subside, after which regular aseptic root canal treatments were started.

Bacteriologic tests taken one week later showed a great many streptococci (Jan. 27, 1938); a culture (Feb. 4, 1938) showed small *Staphylococcus albus.* After another week (Feb. 11, 1938) the culture was negative; on Feb. 18, 1938, the culture was again negative. The canal was then filed and prepared for the

root filling material. The measurement wire was placed into the canal as shown in the roentgenogram film, Fig. 2. On March 2, 1938, the culture was again negative, and on March 8, the root canal was filled with gutta percha. The roentgen film, Fig. 3, shows the tooth after the filling giving evidence of slight overfilling of the root canal.

The patient was seen at various times for a check-up by means of roentgen studies. On May 25, 1938, the radiolucent area had decreased considerably in size, as shown in Fig. 4. On Dec. 9, 1938, there was marked change which showed

Fig. 1.

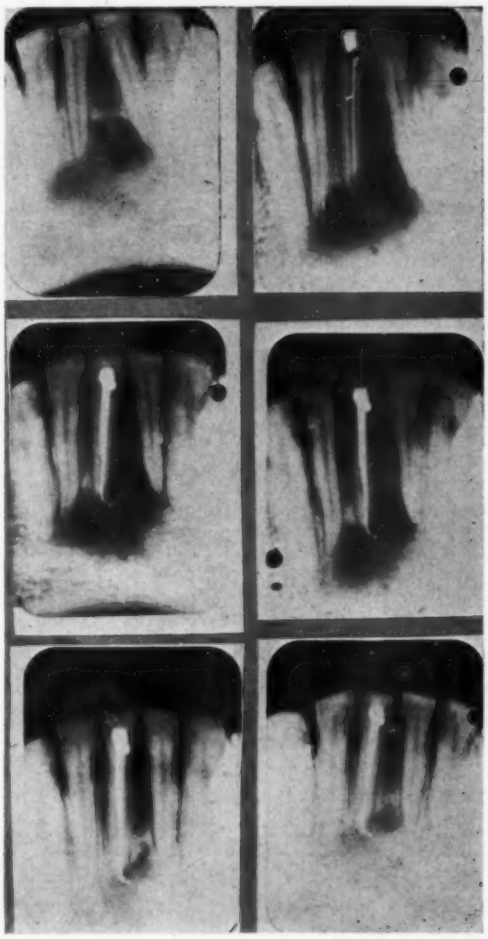

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

healing of bone, and another picture (Fig. 5), taken on March 15, 1939, showed not only healing but also a decided change in the alignment of the teeth. These conditions are shown in Fig. 6. The apices had come closer together and the mesial angles of the two incisors had moved apart.

Department of Orthodontic Abstracts and Reviews

Edited by

Dr. J. A. Salzmann, New York City

All communications concerning further information about abstracted material and the acceptance of articles or books for consideration in this department should be addressed to Dr. J. A. Salzmann, 654 Madison Avenue, New York City.

Anomalies of the Shapes and Number of Teeth and the Question of Their Hereditary Significance: By Dr. Bierdemann (Halberstadt), *Zahnarzt. Rundschau* **44**: 1692-1696, 1939.

Bierdemann quotes Busch on supernumerary teeth which occur in 1.3 per cent of people, mostly in the maxilla, especially in the premaxillary region. Busch divides supernumerary teeth into three categories: 1. Pegteeth with conical crowns and roots, smaller than normal teeth. 2. Multicuspid teeth with deep occlusal pits. 3. Teeth which are normal in size and appearance but which are supernumerary or supplementary to the normal members. Histologically, there is no difference between normal and supernumerary teeth.

The following reasons have been advanced for the occurrence of supernumerary teeth: Doubling or fission of the tooth germ; the formation of a secondary tooth germ through branching; proliferation from the epithelial band; overproduction of tooth germs; the activity of epithelial rests, branching of the embryonic dental papillae. Still others consider supernumerary teeth as an atavistic occurrence. Diagnosis must be made according to each particular case.

Because of crowding, supernumerary teeth may lead to positional and occlusal anomalies, speech interferences, decubital swellings on the cheeks and tongue, caries of the adjacent teeth and of the supernumerary tooth itself.

Deficiency of teeth is rarer than occurrence of supernumeraries. The wisdom tooth is the most frequently missing. The maxillary lateral incisor is next in order of decreasing frequency.

Stainless Steel: *Science*, Oct. 27, 1939.

A new way to prevent corrosion of stainless steel in salt water was described at the opening meeting of the American Institute of Mining and Metallurgical Engineers at Chicago by Dr. H. H. Uhlig, research associate of the Massachusetts Institute of Technology. Dr. Uhlig's research, supported by grants from the Chemical Foundation, shows that if stainless steels are exposed to air for some hours, or if they receive treatment by an oxidizing solution directly after the pickling operation, they will be corrosion-resistant in salt water.

Among the discoveries is the use of small amounts of the chemical that produces smoke for warfare, titanium tetrachloride, to give stainless steel a lustrous

and extra smooth new surface which is especially resistant to pit corrosion. This surface has such luster that it can be fabricated into beautiful jewelry, rivaling precious metals in appearance.

They have also found that minute amounts of silver, as little as .42 per cent, can cut down the salt water corrosion of stainless steels more than 80 per cent. The silver, moreover, greatly improves the rolling and machining properties of the metal.

Perimylolysis. A Contribution Toward the Genesis of Tooth Wasting From Non-Mechanical Causes: By J. J. Holst and Finn Lavge, Copenhagen, *Acta Odontologica Scandinavica* **1**: 36-48, 1939.

Wasting of the teeth is shown to follow in cases of digestive hyperacidity usually accompanied by sour eructations and frequent sour vomiting. Six cases are illustrated of progressive wasting of the teeth which always occurs on certain definite surfaces, especially the lingual surfaces of the teeth.

Because of the localization of the wasting on the lingual surfaces of the maxillary teeth and on the basis of the hydrogen-ion concentration of the saliva being found normal, both when examined in its entirety and in several different places in the same mouth, the inference is drawn that the wasting is caused partly by chemical action due to retention of vomited or eructated gastric acid on the dorsum of the tongue and by the mechanical movements of the tongue against the teeth.

Three Cases of Brown Coloration of the Enamel of all the Teeth in Three Siblings: By Johan Rygge, *Oslo. Acta Odontologica Scandinavica* **1**: 57-74, 1939.

A girl of 18 and two brothers, 19 and 13 respectively, are reported by the author to have shown a brown coloration of the enamel of the deciduous and permanent teeth none of which was carious. A retained canine in the girl was extracted and was found to have yellowish-red enamel. Microscopic examination revealed the coloration to be diffused throughout the enamel to the dentinal border. Spectrographic examination revealed a copper content in the enamel of 0.01 per cent. Copper could not be detected in the dentine or in the cementum of the teeth.

The medical examination revealed nothing pathologic. The blood picture, sedimentation rate, basal metabolism, and Wassermann were negative. All three children had a negative medical history. All three are blondes. The color of the nails, skin, and gums was normal. The parents are also blonde, but their teeth are normal in color.

"Jaw-Winking": The Marcus Gunn Phenomenon: By Carroll R. Mullen, M.D., *Annals of Dentistry,* June, 1939.

An upper eyelid which droops and cannot be voluntarily raised, but which is vigorously elevated on certain movements of the mandible, is the phenomenon of "jaw-winking," first described by Marcus Gunn in 1883. More than 90 per

cent of all reported cases are congenital; the acquired cases are usually from trauma and exposure to cold and may appear at any age. In most cases unilateral ptosis is the rule. Males are more frequently affected than females. The ptosed eyelid is subjected to the involuntary jerking upward by some associated movement of the mandible. The most frequently observed movement accompanies up-and-down mastication. Excessive and excited conversation is another up-and-down movement which may precipitate the sudden upward jerking of the drooping eyelid. In most instances, contraction of the external pterygoid muscle on the same side as the ptosis accompanies the jerking movement. The cause of this condition is not known.

About the Relation Between Vitamin C and Dental Caries: By T. Sandberg and H. Dagulf, Varberg, Sweden, *Acta Odontologica Scandinavica* **1**: 75-83, 1939.

In spite of much apparent evidence to the contrary, the authors show that it is extremely uncertain as to whether vitamin C deficiency can give rise to caries and contrarily whether the administration of vitamin C can prevent the rise of dental caries in man. The amount of ascorbic acid in the blood and the frequency of caries were determined in 186 persons from 7 to 20 years of age. No basis for correlation between vitamin C and caries could be found. The experiments showed that vitamin C is not an etiologic factor in caries causation. Even the very low vitamin C standard in tuberculous patients did not seem to provoke increased occurrence of caries.

Molasses in Anemia: *Science*, Oct. 27, 1939.

Experiments concluded at the Massachusetts Institute of Technology show that old-fashioned molasses is about the best food known for treating nutritional anemia, the kind of anemia due to improper diet. Spinach as a source of iron was thoroughly debunked by the research conducted by Dr. Robert A. Harris, Dr. John W. M. Bunker, and L. Malcolm Mosher. Whereas molasses has 6.1 parts of usable iron per 100,000 parts by weight, spinach has only 0.5. Beef liver has 5.6; oatmeal, 4.6; apricots, eggs, and raisins following in that order. Usable iron was computed, not total content, for only that iron which the body can use to manufacture hemoglobin is valuable. Both chemical and biologic tests on rats were used. It is also reported that recent medical studies indicate that nutritional anemia is far more prevalent than had been suspected. More than 40 per cent of infants have it and the figure for adult women is as high as 70 per cent. It is also fairly widespread among growing children.

The Frenum Labii Superioris: By Enayat Shirazy, *J. A. D. A.* and *D. Cos.* **25,** May, 1938.

Shirazy found the literature on the frenum as well as on the lips of man scant and scattered. The frenum may be abnormally developed from hypertrophy with or without a diastema between the first maxillary incisors.

At birth, the frenum reaches the incisive pad (papilla palatina) which is situated in the midline in the anterior aspect of the palate. With the erup-

tion of teeth and the formation of a definite alveolar ridge, the position of the frenum, in the majority of persons, is in the midline of the mucoperiosteum covering the alveolar ridge a short distance above the gingival line of the maxillary incisors. The growth of the alveolar ridge appears to affect the labial position of the frenum.

Herbst and Apffelstaedt suggest that this diastema may be due to hyperplasia of the premaxillary element of the maxilla or to an increase of space in the alveolar ridge of the anterior portion of the maxilla due to want of development of the second maxillary incisors. They further assert that "whether the frenum is actually the cause or an accompanying symptom, will be left as an open question."

While the treatment advised for correcting this anomaly has been surgically moving the frenum into its proper position on the labial aspect of the alveolar mucoperiosteum, followed by orthodontic measures to correct the diastema when present, Schwarz and Abbott rule out surgical intervention on account of the scar tissue which follows the operation, preventing adequate orthodontic approximation of the separated first maxillary incisors.

Shirazy favors the method of Schwarz and Abbott, but suggests that the ideal treatment is to correct the diastema by orthodontic means and to establish the position of the frenum surgically while the orthodontic appliances are still in position. The scar tissue developing after obliteration of the diastema should unquestionably aid in keeping the first maxillary incisors in proper approximation. The proper time for correcting the deformity is after the permanent maxillary incisors and canines have completely erupted.

Acta Odontologica Scandinavica: Published by the Danish, Finnish, Norwegian, and Swedish Dental Societies. Vol. 1. No. 1.

The principal object of this bimonthly *Journal* is to present Scandinavian dental literature to foreign readers as well as to protect the priority rights of Scandinavian dental authors. G. Y. Hildebrand of Stockholm, who is well known in American dental circles, is the Editor. The Journal is printed in English with French and German summaries appended to each article, although articles may occasionally appear also in French or German with summaries in the other two languages mentioned. We have not received any additional copies since the first one, but hope that the war has not interfered with this worthwhile venture.

Volume 1, No. 1, contains a brief historical review of the development and evolution of dentistry which, according to T. Borg of Stockholm, the author, should more correctly be known as odontology. But even here, the author feels that odontology is not fully indicative of the scope of dental art and science which is so much concerned with all the oral tissues in relation to the body as a whole. However, odontology has accumulated so much scientific knowledge and has perfected the art of treatment of the teeth in its own peculiar way, altogether different from medicine, that to bring odontology into the general medical scheme would result in confusion with detriment to the former. Odontology is defined as "the science dealing with the masticatory organ and maintaining it in its optimal function."

BOOK REVIEW

Nutrition and Physical Degeneration: A Comparison of Primitive and Modern Diets and Their Effects: By Weston A. Price, M.S., D.D.S., F.A.C.D. Member of Research Commission, A.D.A.; Member American Association of Physical Anthropologists; Author of *Dental Infections; Oral and Systemic.* Foreword by Ernest A. Hooton, Professor of Anthropology, Harvard University. With 134 Illustrations. Pp. 431. Cloth. Price $5.00, New York, Paul B. Hoeber, Inc., 1939.

As indicated by Professor Hooton in his foreword to this book, most scientists and researchers interested in dental caries have given their attention to investigations dealing with the reason why the teeth of civilized man are faulty. Price, on the other hand, has been occupied mostly with finding why some people—savages and those living under primitive conditions—have good teeth.

Price occupies today a unique position in dental research, and will continue to occupy it for time to come because he has pioneered on many trails that have since been traversed by others who enjoy better facilities than he to carry on their investigations. Whether or not those who revisited his terrain agreed with him is not as significant as is the fact that were there no Weston Price much research in dentistry would not have been undertaken. Price functioned as a mordant and a catalyst to the younger men in dental research.

There is no gainsaying the oft-repeated fact brought out by Price that the "white man's" diet is poison to the dentition of primitive races. At the same time many of the diseases to which savage peoples have established a natural immunity are fatal to the white man. It is quite likely, also, that the white man would not thrive on primitive diets to the extent shown by aborigines.

It is difficult to concur fully in the conclusions drawn by Price which may be stated briefly in this following manner. Poor nutrition is productive of poor dentition and dentofacial development, which in turn leads to mental deterioration and criminal tendencies. The "criminal type" as judged by facial appearance has long been exploded as a myth. Likewise, with all due respects to the author, while malocclusion may indeed be termed inhibited growth, it is not necessarily inhibited heredity.

Price has written an exceedingly interesting book which has been chosen as a "Scientific Book of the Month." He has opened new vistas. It is our belief that his fame will rest largely as a leader and guide. The true value of his work will come to us as a result of laboratory research to follow. The book will be found interesting by laymen as well as dentists, dental hygienists, physicians, nutritionists, and workers in physical anthropology.

Treatment by Diet: By Clifford J. Barborka, B.S., M.S., M.D., D.Sc., F.A.C.P., Department of Medicine, Northwestern University Medical School, Chicago; formerly Consulting Physician, the Mayo Clinic. Illustrated, pp. 691, Philadelphia, J. B. Lippincott Co., 1939.

The fourth edition of Barborka's work, coming but a scant two years since the third edition was published, attests the popularity of this volume as well

as the rapidity with which new knowledge is added in the field of diet and nutrition.

While the book is primarily intended to provide physicians with a practical, workable method of prescribing diets and applying treatment by diet in health and disease in general, the dentist will find here a great deal of practical value. Prenatal and lactation diets are provided, and a chapter is presented on dental caries for the purpose of correlating the available data on the causation of caries. An interesting chart is presented which illustrates the important factors that may influence dental caries. The book has a complete index and a bibliography.

A Dictionary of Foods and Nutrition: By Lulu G. Graves. Consultant, Foods, Nutrition, Diet Therapy; Formerly Professor of Home Economics, Cornell University. Author of *Modern Dietetics;* Foods in Health and Disease; and Clarence Wilbur Taber, Author of *Taber's Medical Dictionary, The Economics of the Family,* etc. Pp. 423, Philadelphia, F. A. Davis, 1938.

Those interested in diet will find here definitely established data, gathered from leading authorities. The principal facts pertaining to all foods have been included, together with interesting items concerning their history. Indications and contraindications for the use of any particular food in a disease have been eliminated, owing to the diverse opinions among practicing physicians and dietary experts.

There is considerable material presented pertaining to the physiology of digestion, assimilation, and nutrition. Many tables on the vitamin and nutritive value of foods have been included.

Brush Foundation Continues

The trustees of Western Reserve University and of the Brush Foundation have entered into an agreement by which the work on human growth, development, and sex initiated by the late T. Wingate Todd for the Brush Foundation and other foundations, as well as future studies sponsored by the Brush Foundation, will be conducted through the School of Medicine. Dr. William W. Greulich, research associate in anatomy and physical anthropology at Yale University School of Medicine, has been appointed director of the foundation and professor of physical anthropology and anatomy in the department of anatomy in the medical school.

Dr. B. Holly Broadbent, director of the Bolton Foundation, affiliated with the School of Medicine of Western Reserve University, delivered the fourth Frank Billings lecture of the Thomas Lewis Gilmer Foundation of the Institute of Medicine of Chicago, on November 24. His subject was "Clinical Significance of a Roentgenographic Method of Measurement of Disturbances of Facial Growth."

Editorial

The Dental Centenary Celebration

THE Dental Centenary Celebration to be held in Baltimore, Md., March 18, 19, and 20, 1940, sponsored by the American Dental Association, promises to be one of the high lights in the upward march of American dentistry.

Thousands of dentists and laymen from all parts of the globe will come to Baltimore to attend the celebration, the birthplace of the dental profession and the home of the first dental college in the world.

The plans of the Local Arrangement Committee are practically complete. The Lord Baltimore Hotel will be used as the headquarters of the meeting and will house all those taking an active part in the program. Many interesting arrangements are being made for the meeting; for instance, twenty outstanding visiting dentists will deliver addresses before local civic clubs, high schools, and over the radio. These men will speak on health topics, dental progress and aims, and they are being relied upon to carry to the public the message of the profession concerning this Centenary Meeting and the story of dentistry.

The University of Maryland will hold an Academic Convocation, impressive features of which will be the large and colorful academic procession and the conferring of honorary degrees. In this session universities, colleges, and other educational institutions, as well as foreign, national, and state dental bodies, will join in commemorating the founding of the Baltimore College of Dental Surgery, the first dental school in the world.

The scientific sessions of the Centenary meeting are divided into eighteen sections. Three papers will be read before each section, and each section will meet but once. The sections have been so arranged that those in attendance may derive the most from the subjects in which they have particular interest, and an effort has been made to see that the sections closely allied with one another will not meet at the same time. The section officers are an honorary Chairman and an honorary Vice-Chairman, with the Secretary chosen from the Baltimore dentists in order to facilitate the order and handling of the program.

No doubt, some sections which have been so efficiently arranged will be of interest to the readers of THE AMERICAN JOURNAL OF ORTHODONTICS AND ORAL SURGERY. Accordingly, in the News and Notes department of this issue of the Journal is the preliminary program of an event that will be one of the outstanding dental gatherings of the century.

One hundred years of history of dentistry in America are about to be commemorated in the City of Baltimore, a celebration of which the entire dental profession will, no doubt, have reason to feel proud.

In Memoriam

Thomas L. Grisamore

1875—1939

DR. THOMAS GRISAMORE, orthodontist of Chicago, passed away at his home in Wilmette, Ill., Oct. 16, 1939.

For forty years Dr. Grisamore was very active as a practitioner and teacher. He received his dental degree from the Chicago College of Dental Surgery in 1908 and engaged in the general practice of dentistry in that city until 1911 during which year he decided to limit his practice to orthodontics.

Dr. Grisamore's teaching positions were varied. In 1903 he became an instructor in material medica and therapeutics in the School of Dentistry, University of Illinois; in 1904, associate professor of the same subjects; and in 1905, professor of dental chemistry and metallurgy. In 1908 he accepted the position of instructor in orthodontics at the Chicago College of Dental Surgery; in 1910 he was made associate professor, and in 1919 advanced to the rank of professor, taking over the teaching position in orthodontics formerly occupied by the late Calvin S. Case.

He was honored with many positions of trust. He was secretary of the Chicago Dental Society and in turn its president. He was for years the Treasurer of the Illinois State Dental Society and also later its president. At a later date he served a full term as trustee of the A. D. A. To name the various organizations of his profession to which he belonged it would be necessary to name the majority of them that exist.

It has been said of him by his very close friends that he avoided participation in useless controversial questions, but conserved his energy and his interest for those things which he thought were really worth while and constructive. He was loyal to his friends. Though a man of deep feeling, it is doubtful if his voice was ever raised in anger—and herein may be found one of the major reasons why the children who formed the greater part of his practice not only held him in high regard, but had a great affection for him.

All of these factors contributed to the gradual development of the man and the practitioner who for forty-one years proceeded steadfastly and directly as a teacher and a leader in his profession.

Dr. Grisamore was a quiet, modest, painstaking, and cultured gentleman. He was faithful to every obligation, stable in character, affable in manner, pleasing in demeanor, and consistent in devotion to what he believed to be right. His unvarying good nature and comradeship won for him the deep affection and admiration of a host of friends. He had a keen conception of his duty to students and his interest in them continued through their professional careers. His home life was exemplary and typical of the best traditions of that essential unit of our American civilization.

Dr. Grisamore left his wife Eva Grisamore, his daughter, Mrs. Wm. R. Bayliss, and his son Dr. Thos. Grisamore, Jr., who was associated with his father in orthodontic practice, and who will no doubt continue in the work his father set out to accomplish.

Van A. Stilley, Jr.

Dr. Van A. Stilley, Jr., orthodontist of Paducah, Ky., passed away at his home in Paducah, Nov. 29, 1939.

Dr. Stilley was graduated from the Vanderbilt University with the D.D.S. degree and practiced dentistry for several years at Benton, Ky. Later because of an intense interest in children he left general practice, took some advance work in orthodontics, and practiced this specialty in Paducah from 1930 until the time of his death. He was a member of the American Association of Orthodontists, Phi Beta Kappa and Psi Omega fraternities, the Masonic Lodge, Knights Templars, and he was a Shriner. Dr. Stilley was also active in the Denver Seminar each summer. He served as Secretary of the Southwestern Kentucky Dental Society for a number of years and was its president at the time of his death. He was also a member of Rotary International, and gave generously of his time to civic affairs. He was a fellow in the International College of Dentists. In his religious life he was a member of the Methodist Church of Benton, Ky.

Dr. Stilley enjoyed a very wide friendship in the dental profession during his life time and in his passing he is survived by his father, Dr. Van A. Stilley, Sr., his wife, Mrs. Bulena Stilley, and a son, Van Stilley, Ill.

John A. McPhail

It seems to me that some other way might be used to say that one of our colleagues has passed on to the Eternal Something, than the mere recording of facts, that he was born, married, reared a family, and ceased to exist. Let us think that John A. McPhail entered this life Feb. 10, 1877, in a little town of Walkerton, Ontario, to begin a useful purpose bestowed in him by honest, upright parents, a heritage that he never betrayed even unto death.

From humble surroundings, he cautiously planned his future so that he might bring credit not only to his forebears, but to all who may have had the opportunity to know him.

John A. McPhail had a full capacity of understanding, a quiet individual of sincere intent and purpose. His ability to see something good in all of his acquaintances was unparalleled. He continued this effort to better himself, not only in his professional life, but in the understanding of mankind and its eccentricities.

John A. McPhail was a family man; he loved his home and those near and dear to him. His appreciation of flowers and the great outdoors instilled in him the finer things of life.

A kindly father and loving husband were attributes built upon a foundation of years of patience and understanding. He loved books and never overlooked an opportunity to secure those which would lend him a greater and finer outlook on life. Friends once made were one of his greatest assets, and never forgotten. He never forgot those who were in his employ, even long after, when they were rearing families of their own.

All of these characteristics made of him an individual long to be remembered by those with whom he came in contact.

To his loving wife, Anna Stevenson McPhail, and two sons, Neil and Donald, a little verse he liked so well:

I shall pass through this world but once;
Any good therefore that I can do,
Or any kindness that I can show
To any human being
Let me do it now, let me not defer or neglect it,
For I shall not pass this way again.

E. R. Cumley

News and Notes

American Association of Orthodontists

The 1940 meeting of the American Association of Orthodontists will be held May 13 to 16, in Chicago, Ill. Plans are being completed rapidly for what is expected to be one of the outstanding meetings of the Association, which now has a membership that exceeds 650 members. The Chicago meeting, held in a central location, promises to have one of the largest attendances in the history of the organization.

Missouri-Kansas Dental Meeting

The Missouri-Kansas Dental Meeting will be held at the Municipal Auditorium in Kansas City, Mo., April 28 to May 1, 1940.

Cleveland Spring Clinic Meeting

The Annual Spring Clinic Meeting of the Cleveland Dental Society will be held April 8 and 9, 1940, at the Statler Hotel.

Southern Society of Orthodontists

The Southern Society of Orthodontists will hold its annual meeting in New Orleans, La., April 1 and 2, 1940.

New York Society of Orthodontists

The spring meeting of the New York Society of Orthodontists will be held at the Waldorf-Astoria in New York City, March 11 and 12, 1940. Admission by invitation.

WILLIAM C. KELLER, Secretary-Treasurer
40 East 49th Street
New York, N. Y.

Chicago Association of Orthodontists

The Chicago Association of Orthodontists will meet March 25, 1940, at the Palmer House. Dr. Murray Hoffman and Dr. Morrie Massler of the Department of Histology, University of Illinois, will present a paper, "A Study of Bone Changes Incident to Eruption of Rat Molars."

Massachusetts Dental Society

The next annual meeting of the Massachusetts Dental Society will be held at the Hotel Statler, Boston, April 22 to 25, 1940. Dr. William H. Griffin, 520 Beacon Street, Boston, is president, and Dr. Philip E. Adams, 106 Marlborough Street, Boston, is secretary.

C. O. Simpson Receives Callahan Award

Dr. C. O. Simpson, dental radiologist of St. Louis, Mo., who has appeared several times as an essayist on the programs of the American Association of Orthodontists, has received the Callahan Memorial Award for the year 1939. The honor was bestowed at the Ohio State Dental Society Meeting May 6, 1939, at which time Dr. Simpson read a paper entitled, "The Radiodontic Factor in Dental Conservation."

The Callahan Memorial Commission was created within the Ohio State Dental Society on Dec. 2, 1920. Funds were contributed in sufficient amount to finance the erection of a Bronze Memorial to Dr. Callahan. This was placed on the Cincinnati General Hospital Grounds in Cincinnati and moved to the Dental Department of Ohio State University where it occupies a very prominent place in the Clinic Room of the Dental School.

With the income from the balance of funds the Callahan Memorial Award was established, and a commission consisting of four Ohio dentists and three out-of-state dentists, each year selects someone who has made valuable scientific contributions to the dental profession to be the recipient of this award.

Those having received this award up to the present are:

James Leon Williams
Frederick Bogue Noyes
Clarence J. Grieves
Edward C. Rosenow
Percy R. Howe
Howard Riley Raper
William John Geis
Russell Welford Bunting
Rodrigues Ottolengui
Weston A. Price
Hermann Prinz
Homer C. Brown
U. Garfield Rickert
E. V. McCollum
C. N. Johnson
Harvey J. Burckhart
Joseph L. T. Appleton

The Scientific Sessions Dental Centenary Celebration

MONDAY, MARCH 18, 2:00-5:00 P.M.

Roentgenology (Room A, Basement Floor)

Honorary Chairman: Howard Raper, Albuquerque, N. M.
Honorary Vice-Chairman: Henry C. Fixott, Portland, Ore.
Secretary: George Karn, Baltimore, Md.
Essayists:

"Detrimental Biological Effects of Roentgen Rays"
Walter S. Thompson, Los Angeles, Calif.

"Roentgenological Examinations Are Still Fraught With Danger"
LeRoy M. Ennis, Philadelphia, Pa.

"Roentgenographic Study of the Reactions of the Dental Pulp to Trauma and Complications Arising in the Tri-Facial Nerve"
L. R. Main, St. Louis, Mo.

Full Dentures (Room B, Basement Floor)

Honorary Chairman: Charles R. Turner, Philadelphia, Pa.
Honorary Vice-Chairman: H. V. Cottrell, Columbus, Ohio
Secretary: Grayson W. Gaver, Baltimore, Md.
Essayists:

"A Century of Progress in Denture Base Materials"
Rudolph O. Schlosser, Chicago, Ill.

"Factors in the Solution of a Constant Problem in Denture Service—Jaw Relations"
Carl O. Flagstad, Minneapolis, Minn.

"Present Trends Which Threaten Prosthetic Oral Health Service of the Future"
Walter H. Wright, Pittsburgh, Pa.

Medical Relations (Room C, Mezzanine Floor)

Honorary Chairman: William J. Gies, New York, N. Y.
Honorary Vice-Chairman: Vilray P. Blair, St. Louis, Mo.
Secretary: Arthur Lankford, Baltimore, Md.
Essayists:

"The Medico-Dental Aspects of Allergy"
Robert A. Cooke, New York, N. Y.

"Pains of the Head and Face of Non-Dental Origin"
Walter E. Dandy, Baltimore, Md.

"The Effect of the Endocrines on the Dental Apparatus"
Isaac Schour, Chicago, Ill.

Operative Dentistry (Room D, Mezzanine Floor)

Honorary Chairman: George W. Wilson, Milwaukee, Wis.
Honorary Vice-Chairman: Oborn G. L. Lewis, Philadelphia, Pa.
Secretary: B. Holly Smith, Baltimore, Md.
Essayists:

"The Function of the Operative Dentist in Conserving Teeth and Health"
Robert E. Blackwell, Chicago, Ill.

"An Evaluation of Recent Developments in Clinical Operative Dentistry"
Harold E. Tingley, Boston, Mass.

"Present-Day Silver Amalgam Alloys, Science of Development and Manipulation"
Claude C. Cannon, Fayette, Ala.

Orthodontics (Room E, Mezzanine Floor)

Honorary Chairman: John V. Mershon, Philadelphia, Pa.
Honorary Vice-Chairman: B. Maxwell Stephens, London, England
Secretary: Harry E. Kelsey, Baltimore, Md.
Essayists:

"The Diet of the Child"
Edwards A. Park, Baltimore, Md.

"Objectives in Orthodontic Treatment"
James D. McCoy, Los Angeles, Calif.

"The Etiology of Malocclusion Considered From a Clinical Viewpoint"
Harold J. Noyes, Chicago, Ill.

Dental Materials (Room F, Mezzanine Floor)

Honorary Chairman: Wilmer Souder, Washington, D. C.
Honorary Vice-Chairman: Eugene W. Skinner, Chicago, Ill.
Secretary: J. Fred Emerson, Baltimore, Md.
Essayists:

"Inlay Casting Procedure—Its Evolution and Manipulatory Variables"
Philander B. Taylor, Cleveland, Ohio

"Non-Metallic Denture Materials—Their Development and Relative Merits"
Horton Kimball, Detroit, Mich.

"Dental Cements"
George C. Paffenbarger, Washington, D. C.

TUESDAY, MARCH 19, 2:00-5:00 P.M.

Oral Diagnosis and Bacteriology (Room A, Basement Floor)

Honorary Chairman: Weston A. Price, Cleveland, Ohio
Honorary Vice-Chairman: Edgar D. Coolidge, Chicago, Ill.
Secretary: Harold Goldstein, Baltimore, Md.
Essayists:

"Review and Further Studies on the Relation of Dental Infection to Systemic Disease"
Edward C. Rosenow, Rochester, Minn.

"Problems in Oral Microbiology as Problems in Ecology"
J. L. T. Appleton, Philadelphia, Pa.

"Case History in Oral Diagnosis"
Daniel E. Ziskin, New York, N. Y.

Removable Partial Dentures (Room B, Basement Floor)
Honorary Chairman: Russell W. Tench, New York, N. Y.
Honorary Vice-Chairman: F. C. Elliott, Houston, Texas
Secretary: Thomas J. Bland, Jr., Baltimore, Md.
Essayists:
"The Effect of Abnormalities of Occlusion Upon the Temporo-Mandibular Joint and Associated Structures"
Clyde H. Schuyler, New York, N. Y.
"Stresses Induced by a Partial Denture Upon Its Supporting Tissues and Practical Means of Effecting Their Control"
Oliver C. Applegate, Ann Arbor, Mich.
"Practical Engineering as Applied to Removable Partial Denture Designing"
N. G. Wills, Connersville, Ind.

Local and General Anesthesia (Room C, Mezzanine Floor)
Honorary Chairman: Bissell B. Palmer, New York, N. Y.
Honorary Vice-Chairman: Richard H. Riethmuller, Los Angeles, Calif.
Secretary: Brice Dorsey, Baltimore, Md.
Essayists:
"The History of Anesthesia"
W. Harry Archer, Pittsburgh, Pa.
"The Principles of Anesthesia Related to the Practice of Oral Surgery"
Malcolm W. Carr, New York, N. Y.
"Anesthesia in Modern Dentistry"
Frank B. Hower, Louisville, Ky.

Ceramics (Room D, Mezzanine Floor)
Honorary Chairman: Albert L. LeGro, Detroit, Mich.
Honorary Vice-Chairman: Carlisle Bastian, New York, N. Y.
Secretary: Ernest B. Nuttall, Baltimore, Md.
Essayists:
"Porcelain as a Filling Material"
E. Bruce Clark, Pittsburgh, Pa.
"Porcelain Bridgework With Metal Reinforcements"
Nye Goodman, Los Angeles, Calif.
H. D. Grubb, Cleveland, Ohio

Embryology, Histology and Pathology (Room E, Mezzanine Floor)
Honorary Chairman: Edward H. Hatton, Chicago, Ill.
Honorary Vice-Chairman: Paul G. Kitchin, Columbus, Ohio
Secretary: Myron S. Aisenberg, Baltimore, Md.
Essayists:
"Correlation Between Clinical and Pathological Diagnosis in Chronic Apical Periodontitis"
Rudolf Kronfeld, Chicago, Ill.
"The Interrelation of Maturation and the Histogenesis of Hypoplasia in Dental Enamel"
Samuel W. Chase, Cleveland, Ohio
"Histology: An Aid in the Treatment of Sensitive Teeth and the Desensitization of Dentin"
Charles F. Bodecker, New York, N. Y.

Public Health (Room F, Mezzanine Floor)
Honorary Chairman: Charles E. Rudolph, Minneapolis, Minn.
Honorary Vice-Chairman: Frank C. Cady, Washington, D. C.
Secretary: Richard C. Leonard, Baltimore, Md.
Essayists:

"Dentistry: Its Purposes and Its Problems in Public Health"
Leon R. Kramer, Topeka, Kan.
"Dentistry in Public Health—A Problem in Research"
Abel Wolman, Baltimore, Md.
"Dentistry in Public Health—Opportunities and Responsibilities"
O. W. Brandhorst, St. Louis, Mo.

WEDNESDAY, MARCH 20, 2:00-5:00 P.M.

Oral Surgery (Room A, Basement Floor)
Honorary Chairman: George B. Winter, St. Louis, Mo.
Honorary Vice-Chairman: LeRoy M. S. Miner, Boston, Mass.
Secretary: Howard Van Natta, Baltimore, Md.
Essayists:
"Oral Surgery and Its Relation to Dentistry and Medicine"
Howard C. Miller, Chicago, Ill.
"Surgery by the Dental Surgeon"
Henry Sage Dunning, New York, N. Y.
"The Inter-Relation of Dentistry and Surgery in the Treatment of Deformities of the Face and Jaws"
V. H. Kazanjian, Boston, Mass.

Fixed Partial Dentures (Room B, Basement Floor)
Honorary Chairman: Edward T. Tinker, Minneapolis, Minn.
Honorary Vice-Chairman: Stanley D. Tylman, Chicago, Ill.
Secretary: Walter L. Oggesen, Baltimore, Md.
Essayists:
"A New and Accurate Method for Construction of Fixed Partial Restoration Using Hydro-Colloidal Impression Materials"
Karl W. Knapp, New York, N. Y.
"Fixed Partial Denture Service—Problems and Trends"
A. O. Klaffenbach, Iowa City, Iowa
"The Modern Fixed Partial Denture Pontics"
Irvin H. Ante, Toronto, Canada

Practice Management (Room C, Mezzanine Floor)
Honorary Chairman: Ralph R. Byrnes, Atlanta, Ga.
Honorary Vice-Chairman: Allan T. Newman, New York, N. Y.
Secretary: Burt B. Ide, Baltimore, Md.
Essayists:
"Ideals and Principles in Practice Management"
Albert L. Midgley, Providence, R. I.
"Five Phases of Successful Practice Management"
Gaylord J. James, Cleveland, Ohio
"For Professional Services Rendered"
Robert K. Brown, Ann Arbor, Mich.

Pedodontia (Room D, Mezzanine Floor)
Honorary Chairman: Harvey J. Burkhart, Rochester, N. Y.
Honorary Vice-Chairman: Percy Howe, Boston, Mass.
Secretary: Myron Price, Baltimore, Md.
Essayists:
"Child Health—A Dental Obligation"
Walter T. McFall, Asheville, N. C.
"Fundamental Procedures in Cavity Preparation and Space Retention as Adapted to the Deciduous (Foundation) and Young Permanent Teeth"
John C. Brauer, Iowa City, Iowa
"The Development of Dentistry for Children With Particular Reference to Root Canal Therapy"
John E. Gurley, San Francisco, Calif.

Periodontia (Room E, Mezzanine Floor)

Honorary Chairman: Paul R. Stillman, Longwood, Fla.
Honorary Vice-Chairman: Arthur H. Merritt, New York, N. Y.
Secretary: Glenn Carter, Baltimore, Md.
Essayists:

"Fundamentals of Periodontal Pathology"
Kurt H. Thoma, Boston, Mass.

"Treatment of Periodontal Disease in the Modern Way"
Olin Kirkland, Montgomery, Ala.

"The Next Step Toward the Advancement of Dentistry Must Be Taken by the Periodontist"
Bruce L. Taylor, Sr., Washington, D. C.

Materia Medica, Pharmacology and Therapeutics (Room F, Mezzanine Floor)

Honorary Chairman: Herman Prinz, Philadelphia, Pa.
Honorary Vice-Chairman: William H. O. McGehee, Washington, D. C.
Secretary: Edward C. Dobbs, Baltimore, Md.
Essayists:

"Biochemistry of Drug Action"
Harold C. Hodge, Rochester, N. Y.

"The Progress of Pulp Canal Therapy"
James R. Blayney, Chicago, Ill.

"The Importance of Controlled Observations in Studies of Local Anesthetics"
M. L. Tainter, San Francisco, Calif.

Washington-Baltimore Society Breakfast

The Washington-Baltimore Society of Orthodontists is arranging for an "orthodontic breakfast," in connection with the Centenary celebration in Baltimore. Breakfast will honor the presidents of the various orthodontic societies and the orthodontists who are taking part in the program. It will also be open to all visiting orthodontists. The time: Monday, March 18, at 8:30 A.M.; the place: Red Room, Belvedere Hotel, Baltimore; the price: $1.00. Visiting orthodontists planning to attend please notify the secretary, Stephen C. Hopkins, 1726 Eye Street, N.W., Baltimore, so that a place may be reserved.

Notes of Interest

Dr. Charles B. Bray announces retirement from private practice Jan. 1, 1940. Dr. Boyd W. Tarpley will assume his orthodontic practice at 2121 Highland Avenue, Birmingham, Ala.

Dr. James E. Rook announces the opening of an auxiliary office at 6677 Delmar Blvd., University City, Mo.

Dr. Leo B. Lundergan and Dr. Earl E. Shepard announce the opening of their offices Jan. 1, 1940, Suite 224-225 Lister Building, 4500 Olive Street, St. Louis, Mo. Practice limited to orthodontics.

Dr. John Sage announces the opening of a Manhattan office in the Wickersham Professional Building, 133 East 58th Street, New York City. Practice limited to orthodontics.

OFFICERS OF ORTHODONTIC SOCIETIES*

American Association of Orthodontists

President, William A. Murray - - - - - - - - - - - - - - - - - - Evanston, Ill.
Secretary-Treasurer, Claude R. Wood - - - - - - - - - - - - - - Knoxville, Tenn.
Public Relations Bureau Director, Dwight Anderson
- - - - - - - - - - - - - - - - - - 2 East 103rd St., New York, N. Y.

Central Association of Orthodontists

President, Max E. Ernst - St. Paul, Minn.
Secretary-Treasurer, L. B. Higley - - - - - - - - - - - - - - - - Iowa City, Iowa

Great Lakes Association of Orthodontists

President, Harvey G. Bean - Toronto, Can.
Secretary-Treasurer, Richard E. Barnes - - - - - - - - - - - - - Cleveland, Ohio

Harvard Society of Orthodontists

President, I. D. Davis - Boston, Mass.
Secretary-Treasurer, Edward I. Silver - - - - - - - - - - - - - - Boston, Mass.

New York Society of Orthodontists

President, Franklin A. Squires - - - - - - - - - - - - - - - - - White Plains, N. Y.
Secretary-Treasurer, William C. Keller - - - - - - - - - - - - - New York, N. Y.

Pacific Coast Society of Orthodontists

President, Will G. Sheffer - - - - - - - - - - - - - - - - - - - San Jose, Calif.
Secretary-Treasurer, Earl F. Lussier - - - - - - - - - - - - - - San Francisco, Calif.

Rocky Mountain Society of Orthodontists

President, Leonard T. Walsh - - - - - - - - - - - - - - - - - - Pueblo, Colo.
Secretary-Treasurer, George Siersma - - - - - - - - - - - - - - Denver, Colo.

Southern Society of Orthodontists

President, A. C. Broussard - - - - - - - - - - - - - - - - - - New Orleans, La.
Secretary-Treasurer, T. C. Sparks - - - - - - - - - - - - - - - Columbia, S. C.

Southwestern Society of Orthodontists

President, J. H. Weaver - Houston, Texas
Secretary-Treasurer, R. E. Olson - - - - - - - - - - - - - - - - Wichita, Kan.

Washington-Baltimore Society of Orthodontists

President, B. E. Erikson - Washington, D. C.
Secretary-Treasurer, Stephen C. Hopkins - - - - - - - - - - - - Washington, D. C.

American Board of Orthodontics

President, Harry E. Kelsey - - - - - - - - - - - - - - - - - - - Baltimore, Md.
Secretary, Charles R. Baker - - - - - - - - - - - - - - - - - - - Evanston, Ill.
Treasurer, Bernard G. DeVries - - - - - - - - - - - - - - - - - Minneapolis, Minn.
William E. Flesher - - - - - - - - - - - - - - - - - Oklahoma City, Okla.
Frederic T. Murlless, Jr. - - - - - - - - - - - - - - - - - - - Hartford, Conn.
Oliver W. White - Detroit, Mich.
James D. McCoy - Los Angeles, Calif.

Foreign Societies†

British Society for the Study of Orthodontics

President, S. A. Riddett
Secretary, R. Cutler
Treasurer, H. R. Evans

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*The Journal will make changes or additions to the above list when notified by the secretary-treasurer of the various societies. In the event societies desire more complete publication of the names of officers, this will be done upon receipt of the names from the secretary-treasurer.

†The Journal will publish the names of the president and secretary-treasurer of foreign orthodontic societies if the information is sent direct to the editor, 8022 Forsythe, St. Louis, Mo., U. S. A.